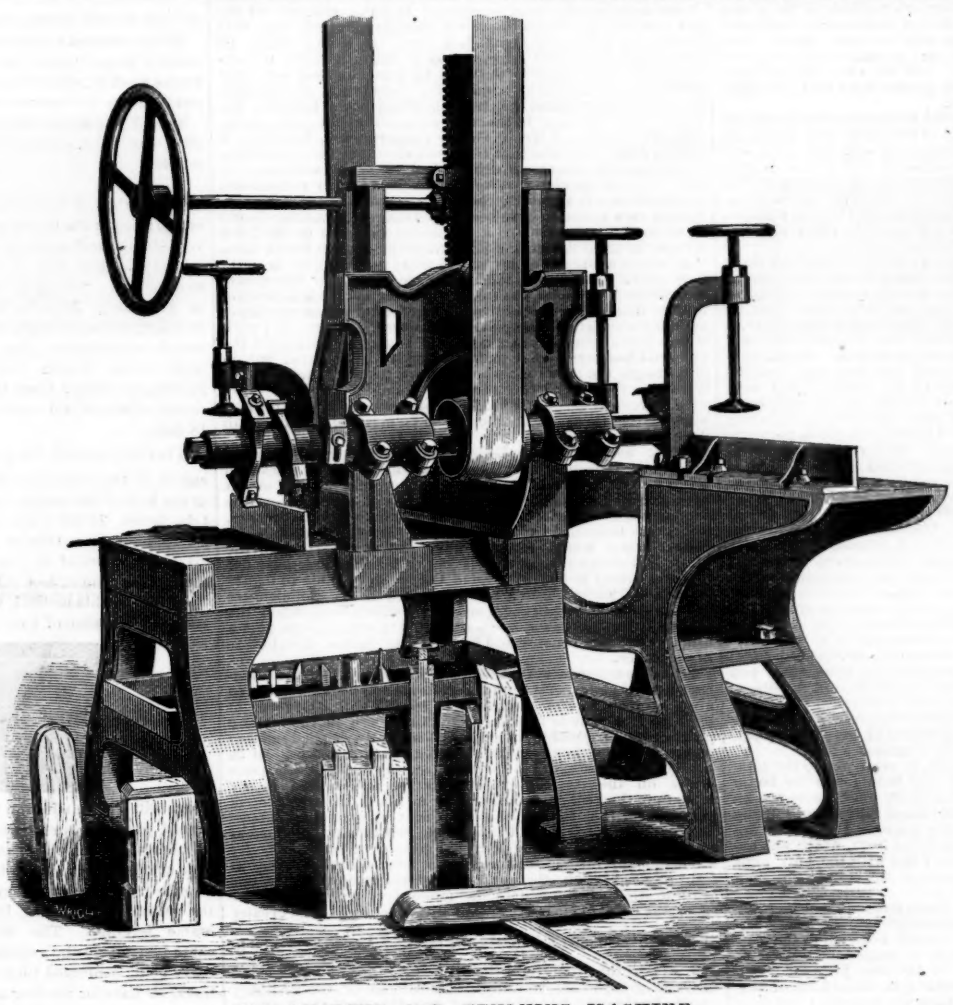
RAILROAD GAZETTE

SATURDAY, FEBRUARY 8, 1873.

Car Shaping and Tenoning Machine.

The machine illustrated herewith was designed by E. H. Rees, Superintendent of the Mansfield Machine Works, of Mansfield, Ohio, and the makers believe that it is the best and the most simple machine known for the accomplishment of the work for which it is intended, and that it meets a want long felt in every establishment working timber for cars, bridges, buildings, etc. The scarcity and high price of skilled labor makes such a machine a great favorite where manfacturing is carried on largely, as inexperienced hands can at once do a perfect job with it with rapidity and accuracy.

The machine is constructed of cast and wrought iron and steel—there being no wood-work about it. It is self-contained; will stand on any floor, requiring no bracing or supports whatever, and occupies very little space. It has no horizontal belt at or near the floor. The cross head carrying the cutter-heads and spindle has a vertical movement of twenty inches, and its movement up or down does not affect the tension of the belt—a fact worth noticing. The cutters are raised and lowered by means of thehand-wheel rack and pinion, and are easily controlled and brought to any desired point. The cutter-heads and spindle are made of the best cast steel, thereby insuring durability and safety from bursting. The proper adjustment of cutters for cutting single, double or triple tenons of almost any form can be rapidly and easily made. Especial attention is called to the fact that tenons on car sills and long timber can be cut on both ends from one face without turning the stick end for end. Cutter heads are fitted to both ends of the spindle, and the machine can be worked from either side, or both sides at the same time.



CAR SHAPING AND TENONING MACHINE.

A Brave Brakeman.

A train having been snowed in on the Milwaukee & St. Paul Railway about seven miles from Calmar, Iowa, and news of the condition of the passengers and their need of food having reached that place, a brakeman named James Wilson took thirty pounds of crackers and cheese and set out in a terrible storm to walk through the snow to the train. The Milwaukee *Evening Wisconsin* describes his walk and its sequel as follows: "The wind blew a gale and, with the thermometer at twenty-seven below, he had a hard road to travel. It was hard work, the wind penetrated through his hood, and, notwithstanding he felt his face and ears freezing, on he trudged, until he reached the train, almost exhausted and unable to speak distinctly, his face ears and nose badly frozen. The train reached by Mr. Wilson was one on which, among the passengers, was Mr. John Lawler, of Prairie du Chien, who had some ladies under his care. Mr. Lawler applied snow to the frozen face of Wilson, and did all that was needed to restore him as much as possible. Mr. Lawler then took from his own neck a massive gold chain, which he had worn for a long time, and putting it around Wilson's neck, remarked: 'It's a pretty good man that has worn that chain, but I've found a better, and he shall have it.' The chain is reputed to be worth up among the hundreds of dollars, and was a handsome present, worthily bestowed. Under touching circumstances like these, the writer of such an incident can hardly tell which to admire the most, the true heroism of the brakeman, who periled his own life to carry aid to his fellow-creatures, or the man who so promptly and generously rewarded the deed of the hero."

Railroad Manufactures.

The Patten Car Works at Bath, Me., are now completed, and employ about 200 hands. The new shops are the wood-working shop, 150 by 75 feet and two stories high; the blacksmith and machine shop, 180 by 50 feet; paint shop, 162 by 75 feet; office, 36 by 25 feet; and erecting shop, 220 by 75 feet. In this last shop are eight tracks, with room to set up eight passenger or sixteen freight cars at once. The shops are well filled with machinery, which is driven by an engine of 100-horse power. Messrs. J. F. & J. Patten are the owners, and Mr. J. W. Trussell, formerly Master Car Builder on the Portland & Kennebec Railroad, is Superintendent.

A new company, called the Iowa Car Company, has been formed in Burlington, Iowa, which intends to put up large shops, for the manufacture of freight cars in Burlington, early in the spring.

Work on the rolling mills at La Grange, Mo., has been suspended for the present. A lack of working capital is said to be the cause of the suspension.

The recently burned buildings of the Adrian Car Company, at Adrian, Mich., have all been rebuilt, with the exception of the paint shop, and the company has nearly its full force of men at work again.

On the Strength and Proportions of Riveted Joints, With the Results of Some Recent Experiments.

By Mr. Walter R. Browne, of Bristol.

DISCUSSION.

[Concluded from page 40.]

Mr. L. Olrick observed that there were many points of interest in the paper which had been read; and as it had been seen that different results had been arrived at in the various experiments made in connection with the subject, it was evident that there would be corresponding differences of opinion as to the proper proportions to be adopted in designing riveted joints. No doubt the principal source of discrepancies in the proportions was the difference in the quality of the plates and rivets employed, and also in the quality of the workmanship. There were indeed so many varying conditions which could not be taken into account in the construction of formulæ, that he thought any expression for the strength of boilers or other riveted work would be to some extent misleading, if adopted without careful examination of all circumstances affecting each particular case. In consequence of the tendency at the present time to work boilers at higher pressures of steam, from 100 to 200 lbs. per square inch, and also the desire to lighten the boilers as much as possible, particularly in the case of boilers for steam fire-engines, road steamers and locomotives, it had now become necessary to introduce a much stronger material than wrought iron for boiler plates; and with steel plates, having a tensile strength of as much as 34 to 36 tons per square inch, it was clear that the table of proportions accompanying the paper would require considerable modifications. As the longitudinal joint in the boiler was the weakest part, and was always double-riveted in boilers exposed to high steam pressures, the mode he used for calculating the safe strength was to take a unit of that joint, equal to the pitch of the rivets, and ascertain what ratio the tensile strain thrown upon this unit bore to the tensile strength of the plate, and also to the shearing strength of the rivets; and in a properly proportioned joint these two ratios would be equal, so as to give the maximum strength of joint. Thus in designing a steam boiler of 4 feet diameter, intended to work at a steam pressure of 150 lbs. and to stand the hydraulic test up to 250 lbs., the steel plates in the shell being $\frac{3}{8}$th inch thick, with a tensile strength of 34 tons per square inch, he had made the joint double-riveted and the pitch of the rivets $1\frac{1}{2}$ inch, placing the rivets so as to form isosceles triangles, and had employed 11-16th inch rivets of Low Moor iron. The strain upon this unit of joint of $1\frac{1}{2}$ inch length and of 48 inches diameter was found by multiplying 48 by $1\frac{1}{2}$, giving 90 square inches, and 90×150 lbs. $= 13{,}500$ lbs., and this divided by the 2 sides then amounted to 6,750 lbs. at each side of the boiler; and the sectional area of the unit of joint being 0·4453 square inch, this multiplied by the tensile strain of 34 tons, or 76,169 lbs., gave a breaking weight of 33,914 lbs., or five times the strain to be actually borne by the unit of joint. This left a much smaller margin of safety than was allowed in ordinary practice for low-pressure boilers; but it must be borne in mind that the boiler had been expressly designed in that case for working at a high pressure, and with a special view to lightness; the boiler, in fact, weighed only 2 tons, though capable of evaporating 48 cubic feet of water per hour. The ultimate tensile strength of the steel plate in the unit of joint of 0·4453 square inch area would be 15·14 tons; and taking only 20 tons per square inch as the shearing strength of Low Moor iron, the total shearing strength of the two 11-16th inch rivets in the unit of double-riveted joint would be 14·84 tons, or practically equal to the tensile strength of the unit of joint. In any boiler intended to work at an unusually high pressure, he thought it was necessary to test the correctness of the proportions by this mode of calculation, in order to avoid being misled by the use of any formula not adapted to the circumstances of the case. In one instance that had come under his observation, of a steel boiler designed to work at a pressure of 180 lbs., with plates only 3-16th inch thick, the rivets had been intended to be $\frac{7}{8}$th inch diameter, with $1\frac{1}{2}$ inch pitch. But on calculating the strength of the longitudinal joints in the above manner, it was found that the shearing strength per unit of joint would be more than 12 tons, while the tensile strength of the plate would be only about 7 tons, showing a great error in the proportions. He had, therefore, altered the diameter of the rivets to $\frac{3}{4}$ inch, by which means their shearing strength of joint was decreased to 7·85 tons, while the tensile strength of the plate was increased to 7·97 tons, thus showing that the $\frac{3}{4}$ inch rivets were the proper size for giving the greatest strength of joint in that instance. With steel plates and iron rivets it was indeed particularly important that the diameter of the rivets should be made large enough, on account of the liability of the hard steel plates to indent the softer metal of the rivets, as alluded to in the paper, especially when a boiler was subjected to so severe a test as a hydraulic pressure of 250 lbs. per square inch.

From the proportion given in the table for the pitch of the rivets in ordinary single-riveted lap-joints, namely, three times the diameter of rivet, it appeared that with $\frac{3}{8}$ inch plates and $\frac{3}{4}$ inch rivets the pitch should be $2\frac{1}{4}$ inches. In practice, however, with rivets of that size, he thought 2 inches was as much as was desirable for the pitch of the rivets, even in boilers working only at 60 to 70 lbs. pressure; for with a greater pitch he had found that if the caulking were done carelessly the plate was liable to be raised between the rivets, in which case it was impossible afterwards to get it down flat again or to make the joint tight at that place. The same remark would apply still more strongly to the case of double-riveted joints with the pitch equal to $4\frac{1}{2}$ times the diameter of rivet. In the steel boiler thathe had mentioned, with 11-16ths inch rivets and $1\frac{1}{2}$ inch pitch, the joints were perfectly tight under the hydraulic pressure of 250 lbs. It frequently happened that caulking was resorted to as a means of concealing the defects of inferior workmanship; and this was a point to which he thought particular attention should be paid, as caulking when carried too far was a great source of damage to the plates. The proportions arrived at in the paper for single-riveted lap-joints had been stated to agree closely with Sir William Fairbairn's table in extensive use, for plates under $\frac{1}{2}$ inch thickness; but he noticed that the agreement did not hold good with regard to the pitch of the rivets for plates 5-16ths and $\frac{7}{16}$ths inch thick, which according to the rule given in the paper should be 1·87 inch and 2·25 inch respectively, but in that table were put down as 1·63 inch and 1·75 inch. These dimensions for the pitch he concurred with the author of the paper in considering too small for plates of those thicknesses, and they would have the effect of unduly weakening the plates by bringing the rivet holes too near together.

The want of sufficient attention to the circumstance that the strain upon the longitudinal joints of a boiler was double of that upon the transverse circular joints, as pointed out in the paper, had been remarkably exemplified in a boiler shown at last year's International Exhibition in London, which was constructed with the transverse joints double-riveted, while the longitudinal joints were only single-riveted. There was no doubt the diagonal seam would give a much stronger boiler than the ordinary longitudinal joint; but he thought a greater amount of labor would have to be expended in the construction of the diagonal-jointed boilers, on account of the difficulty of bending the plates so as to make their edges fit together correctly at the required inclination. It appeared to him also that the cutting of the diagonal plates at the ends of the boiler, for the purpose of finishing off the ends square across, would occasion a considerable amount of waste. On these accounts the diagonal-jointed boilers seemed likely to be somewhat more expensive in manufacture, which might counterbalance the advantages of their construction.

From the table of proportions given in the paper it appeared that in all cases of double-riveted joints chain riveting had an advantage over zigzag riveting in respect of strength. The general practice, however, he believed was to have zigzag riveting, at any rate in boiler work; and when the rivets were so arranged as to form equilateral triangles in the zigzag riveting, he considered a stronger joint was obtained than in chain riveting, because in the latter, with the rivets in the second row placed immediately behind those in the first, it was found that when a severe strain was put upon the joint there was a tendency for the plate to split longitudinally from the rivets in the first row to those directly behind them in the second. This he believed was the objection felt by boiler makers to chain riveting; and another consideration was that, in the event of any flaw in a plate, which generally did not extend far, there was a better chance of the rivet holes missing it in zigzag riveting, or at any rate of getting only one rivet hole in the weak part; whereas in chain riveting, if one rivet occurred at the flaw, the probability was that the same would be the case with the rivet behind it, on account of the flaw running usually in the direction of rolling of the plate, and the joint would consequently be less secure at that part. A practical difficulty met with in the use of zigzag riveting occurred at the corners of the plates in boiler work, where the double-riveted longitudinal joint and the single-riveted transverse joint came together. In setting out the rivet holes on the zigzag method it was found that the last rivet at each end of the inner row could not be got in at its proper place, on account of its coming just upon the inner edge of the lap of the transverse joint. This last rivet had therefore either to be omitted altogether, or else the pitch of the inner row of rivets was gradually diminished towards the ends, so that what had been zigzag riveting in the middle of the longitudinal joint became chain riveting at the ends. The omission of the last rivet seemed an undesirable mode of meeting the difficulty, as it would leave a weak place at that part; and he should be glad to know whether in such

cases any practical objection had been experienced in boilers so constructed, on account of deficiency of strength at the corners of the joints.

Mr. E. B. MARTEN said that in the case of stationary boilers, to which his own experience chiefly referred, it was not so generally necessary to have the very strong joints required for locomotive boilers working at higher pressures. The common experience in stationary boilers with the joints that were exposed to the fire was that the more iron those joints contained the more readily were they affected by the action of the fire; and on this account he thought that butt-joints with single or double cover-strips were not so suitable for stationary boilers as a single-riveted lap-joint, which, although a much weaker joint in itself, certainly appeared to stand the fire better, because the water got to it more readily than to the others and preserved the metal from overheating. He had not had much experience of double-riveting exposed to the fire, but he believed where it was not so exposed it had generally stood well, and he had not met with any instance of a boiler giving way at a double-riveted joint. At the corners where the longitudinal and transverse seams came together, the joint was so exceedingly strong that the omission of the last rivet in zigzag riveting would, he thought, be practically immaterial.

From what he had seen of the diagonal-jointed boiler, that mode of construction seemed to him to recommend itself, not on account of the number of rivets in the diagonal joint giving it an advantage over a longitudinal joint, but simply because the longitudinal joint was the weakest in a boiler; and therefore if it were got rid of by means of one running midway between the longitudinal and transverse directions, a boiler so constructed must evidently be stronger. Only one explosion of a diagonal-jointed boiler had come under his notice, and the line of fracture in that case ran through the body of the plates and not along the joints at all. He had tested small models of boilers made on that plan, but had not been able to keep them sufficiently tight to burst them; a small boiler had, however, been burst by Mr. Wright, and its strength had been found to be more than 40 per cent. greater than that of a similar boiler with longitudinal joints.

With regard to the values assigned in the paper for the shearing, crippling and tensile strength of the rivets and plates, he presumed the variation of these values in different classes of iron would cause considerable variation in the results derived from the expressions which had been given for the proportions of riveted joints; and it would therefore be desirable to ascertain correctly the exact shearing, crippling and tensile strength of the particular iron employed in any work, in order to arrive at the proper proportions for the riveted joints.

Mr. J. G. WRIGHT mentioned that in the trials he had made for ascertaining the strength of the diagonal-jointed boiler he had constructed small experimental vessels 18 inches in diameter, ¼ inch thick, and 3 ft. 6 ins. long, and had burst them by hydraulic pressure. One was made with a longitudinal joint, a second with a diagonal joint at 45 deg. and single-riveted, and a third with a double-riveted diagonal joint at the same inclination, and a fourth with a single-riveted diagonal joint inclined at an angle of 60 deg. to the length of the boiler. They were all made with drilled holes, and put together in the most careful manner possible, and he had great difficulty in bursting them, on account of the difficulty of getting the joints perfectly tight under the very severe pressure. The results arrived at were that the vessel with the single-riveted diagonal joint at 45 deg. was about 45 per cent. stronger than the one with the longitudinal joint; the double-riveted diagonal joint was 60 per cent. stronger, and the joint at 60 deg. gave an increase of strength of as much as 75 per cent. One of the diagonal-jointed boilers of 3 ft. 6 ins. in diameter and 11 ft. length, at present at his works, had been tested by hydraulic pressure up to 350 lbs. per square inch, and had proved perfectly tight under that severe test. In the manufacture of the boilers there was not any difficulty in the bending of the plates, nor any waste in cutting the plates for finishing off the ends of the boiler; by cutting a rectangular plate diagonally across at the angle of 45 deg., one-half was made to fit at one end of the boiler, and the other half at the other end; there was consequently no more waste and very little increase of expense in the construction of the diagonal-jointed boilers as compared with the ordinary mode of construction. The number of rivets in the diagonal joint was no greater per foot run than in a longitudinal or transverse joint, the pitch being kept the same for the diagonal joint.

Mr. H. A. FLETCHER remarked that, in reference to the comparative advantages of lap joints and butt joints for boiler work, it should be borne in mind that in lap joints there was an element of weakness which was not taken into account in any of the experiments referred to in the paper. This was owing to the departure from the true cylindrical form, which was necessitated by the use of the lap joint; but with the butt joint there was no such difficulty, the plates of the boiler shell then forming a perfect circle.

Mr. BROWNE said he was aware there was still considerable difference of opinion as to the comparative advantages of lap joints and butt joints, but he had himself been led to the conclusion that there was not much to be gained by the use of butt joints. It was urged in favor of the butt joint for boiler work that the preservation of the true cylindrical form of the boiler rendered that joint stronger than the lap joint; and that in the ordinary lap joint in boilers the tension on the outside of the outer plate was considerably more than that on the inside of the inner plate. This, however, was not borne out by experment; and having examined a great number of experiments made on the subject, he had found the difference of strength was comparatively small between butt joints and lap joints. The ordinary mode of making experiments upon joints for boiler work was undoubtedly unfavorable to lap joints and favorable to butt joints, because they were made with flat plates by tearing the joint apart by means of two opposite forces acting exactly in line with each other; the result, therefore, was that in a lap joint the first effect of the strain was to pull the two plates into line with each other by bending them at the joint, which must necessarily produce a weakening of the joint, and cause it to yield under a lower strain than that required to tear asunder a butt joint. In a cylindrical boiler, however, he did not think there was any such tendency to strain the lap joints unduly in that way, and the pressure being radial all round the boiler the only tendency was to tear the plate between the rivets or to shear the rivets; and accordingly he did not see any great advantage in using butt joints for boiler work. It must also be taken into account that, even in the event of a lap joint undergoing a slight change of shape under the action of the internal pressure in a boiler, the very yielding of the material tended to bring it into the cylindrical form, which was the form best adapted for resisting the strain. A result of some interest had been furnished by an experiment he had made with an iron bar ¼ inch square, screwed down at the ends upon bearings 2 feet apart, and loaded in the center for the purpose of breaking it; but though loaded with several times the weight by which according to the ordinary rules for transverse strength it ought to have been fractured, it had not broken, simply because it had deflected three or four inches under the load, and when bent at that angle it became like part of the shell of a boiler, and the whole sectional area of the bar was brought into tension, instead of being half in tension and half in compression; and it would thus have required a greatly increased strain to break it.

With regard to the practical application of the proportions given in the paper for riveted joints, it was certainly requisite that the strength of the particular class of iron employed in any case should be ascertained by experiment, in order that the proportions given might be modified to the extent necessary for rendering them correctly applicable. In the expressions given in the paper he had endeavored to embody the mean values of the constants involved, as derived from experiments made with different descriptions of iron, so as to arrive at a pretty fair average for the results. The experiments that he had made use of for the purpose were entirely confined to iron plates and rivets, and therefore the rules for proportioning the joints of steel plates would be somewhat different. Having himself had no experience yet of steel boilers, which he considered were still on their trial, he should be glad to hear the results of their working and of any experiment bearing upon the strength of the joints, which would be of great use. The shearing strength that had been mentioned of 20 tons per square inch for iron rivets in steel plates would, he hoped, be confirmed by further actual trial; this was a higher value than that obtained in Mr. Henry Sharp's experiments, which gave an average of only 18·68 tons per square inch, on account of the steel plates being found to cut into the iron rivets much more readily than iron plates did.

In double-riveted joints with either zigzag or chain riveting, there was, no doubt, a limit to the pitch of the rivets which it would not be well to exceed, because the rivets must be close enough together to enable the plates to stand the caulking. Within this limit he thought chain riveting was preferable to zizzag, inasmuch as it required less width of lap or cover, while giving exactly the same strength; unless, indeed, it were found that in punching one hole immediately behind another there was any tendency of the plate to crack between them.

The higher proportionate strength shown in the table accompanying the paper for joints made with drilled rivet holes, as compared with those in which the holes were punched, was not the result of experiment, as he had not made any experiments upon plates with drilled holes; but with punched holes it was certainly the usual experience that the strength of the net sectional area of the plate was considerably less than that of an equal section of unpunched plate. In drilled plates he had assumed that this deterioration of strength would not exist, as the injury done to the plate by punching was not done by the action of drilling; and in the calculation of the table he had therefore taken the strength of the plate between the drilled holes as equal to the full strength of the solid plate. After the results of Mr. Cochrane's experiments, however, it was no doubt desirable that this point should be more completely ascertained; because if drilling had really no advantage in strength over punching, it would be a mistake to recommend its adoption. It should be observed that in those experiments special care seems to have been taken that the punching should be as good as possible, and in punching only one or two holes for special trial, the work would probably be much better done than where a number of holes had to be punched, as in ordinary work. One reason, indeed, for according the superiority to drilling, was that it was easier to make good work in drilling than in punching, irrespective of the effect of either operation upon the strength of the plates themselves. In punched work it was well known that as a matter of fact a great many of the holes did not correspond, and required to be rimered out in order to get the rivets in; whereas when the plates were drilled, it was hardly possible that the holes should not fit each other with perfect accuracy. If really good work could be insured in punching, there might possibly be no material advantage in drilling.

In the use of thickened-edged plates for boilers, with regard to the objection felt to the employment of the thickened edges for the longitudinal joints, on the ground that the strain upon these joints would then be crossways of the grain of the iron, and consequently the plates themselves would be weaker, it was true that most experiments upon the strength of boiler plates, when tested longitudinally and transversely of the grain, had shown them strongest in the former direction; but this was simply in consequence of the ordinary mode of manufacture, and having been himself engaged in the manufacture of boiler plates, he had every reason to believe that, when the piling of the slab was properly arranged in cross-layers, plates could be produced that would be as strong in one direction as in the other.

From the experiments made upon the strength of the diagonal-jointed plates, and from the information which had been given respecting the manufacture of boilers with that form of joint, he had come to the conclusion that both in theory and practice the diagonal-jointed boiler possesses a decided advantage. It should, however, be observed that the increase of 34 per cent. in strength of the joint, as shown by the experiments on the diagonal-jointed plates, represented rather more than the real gain obtained in a boiler so constructed, because in the testing machine the experimental plates had been subjected solely to the single tensile strain applied at 45 deg. inclination to the diagonal joint; whereas in a boiler the diagonal joint had to sustain two tensile strains acting at right angles to each other, and each at 45 deg. to the joint, one of these strains being double the amount of the other. The effect was consequently a resultant strain, bearing to the greater of the two component tensions the ratio of $\frac{\sqrt{3}}{2}$ to 2, or 1·58 to 2·00, so that the strength of the diagonal joint was increased in the ratio of 100 to 127, as compared with that of the ordinary longitudinal joint; and 27 per cent. was therefore the limit to the increase of strength that could be obtained in a boiler by the adoption of the diagonal joint.

The great loss of strength involved in any description of riveted joint was a subject to which it appeared to him very desirable that attention should particularly be drawn. The experiments on Mr. Wright's plates now exhibited, possessing a tensile strength of 19·7 tons per square inch, showed that in the ordinary single-riveted lap-joint the strength was only 48 per cent. of that of the solid plates; and by the calculations given in the paper, taking the proportions which had been arrived at as the most advantageous, it was seen that 55 per cent. was the highest result which could be obtained with that description of joint. If the present paper and discussion should lead to greater attention being paid to this subject, he should feel that a very desirable object had been gained.

Mr. L. OLBICK inquired whether in the calculations given in the paper for the proportionate strength of riveted joints the effect of the friction produced by the grip of the rivet heads had been taken into account. In experiments made upon plates riveted together with oval rivet-holes, he understood it had been found that a force of as much as four to five tons per square inch of section of rivet was required to make the plates slide upon each other and bring the rivets to their bearing in the oval holes; and the friction would therefore increase to that extent the strength of riveted joints.

Mr. BROWNE replied that the experiments upon which he had based the conclusions arrived at in the paper had all been made upon actual riveted work; and consequently the full effect of the friction produced by the rivets was included in the results.

The PRESIDENT considered the paper which had been read was a highly interesting one, and the discussion had brought out several important points. He was himself strongly impressed with the value of the diagonal joint for riveted work. At first sight it would seem that in the diagonal riveting the strength of the joint would be increased in proportion to the increase of length of the seam, because each rivet would have a smaller longitudinal section of the boiler to deal with, and therefore there would be less strain upon each rivet, the total number of rivets to resist the strain being increased in the proportion of the length of the diagonal seam, or about five to seven for the inclination of 45 deg. It had however been pointed out that in the case of a boiler there was a deduction to be made, in consequence of the joint having to sustain, in addition to the transverse strain, a longitudinal strain of half the amount. There still remained, however, a sufficient increase of strength in the diagonal joint, as compared with the ordinary longitudinal joint, to make it well worth while to adopt that form of construction; and another recommendation of the diagonal joint was that it was not so much weakened by a flaw of equal extent along the line of rivets as the longitudinal joint would be. The plan of increasing the strength of a riveted joint by the use of the thickened-edge plates did not appear to him to be applicable with advantage to the longitudinal seams of an ordinary wrought-iron boiler, because the greatest strain would then come upon the plate in a direction at right angles to the grain or fibre of the iron. It had, indeed, been stated that plates well made were as strong transversely as longitudinally, and no doubt this was the case with finely crystalline qualities of iron, just as with steel; but the more fibrous descriptions of iron were certainly stronger in the direction of the fibre than transversely, and with such plates, therefore, the thickening of the edges for the longitudinal seams did not appear to him to be advisable.

He proposed a vote of thanks to Mr. Browne for his paper, which was passed.

Contributions.

Laying Out Turnouts Without Calculation.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

BOSTON, January 22, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Having noticed an article, by one of your correspondents, on locating frogs, in your last issue, I send the following comments upon it, with an easy and practicable method of laying out turnouts *without calculation*.

Should you deem it fit to insert these in your columns I can send the calculations, or rather equations, for the same method. AMATEUR.

The method of "putting in" a turnout given by "W. M. J." and printed in the GAZETTE for January 11, page 12, is certainly very simple, and seems to work well in the *special* case there calculated. But that it has its limits it will not take us long to ascertain. "W. M. J." finds the length of his switch rail to be 24.48 feet. It is to be supposed that he is supplied with rails longer than 24 feet, which of course he can cut to any length at pleasure. Now, 24 feet is the usual length of rail used in this vicinity, and most of the imported rails are, at present, no longer than this. The almost universal length of switch rails now laid on the railroads of Boston and vicinity is 18 feet.

It is easily proved by geometry that $R = \frac{s^2}{2t}$, where R is the radius of the outer rail of a curve tangent to the main track at the heel of the switch; s the length of the switch rail, and t the throw. It will not be safe to make the latter any less than 0.4 foot. Taking this as a minimum value, we have for the maximum values of R, corresponding to $s = 18$, 24 and 30 feet successively, the figures 405, 720 and 1,125 feet. In a turnout "put in" by this method, the switch rail when "thrown" will take the position of a chord, *A C*, fig. 1, of the curve *A C D*.

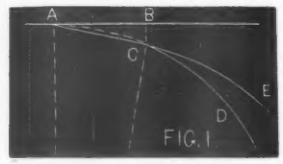


FIG. 1

There will be, in addition to the usual sharp wrench or thrust inward given a train at the moment of passing on to a turnout at the heel of the switch, another of equal or greater magnitude at the toe, which will be more deleterious than the first impulse, as the train, by its reaction, will tend to press the switch rail outward, being able here to exert considerable leverage. The usual practice is to "put in" a curve tangent to the switch rail at its toe, as *CE*, fig. 1. This curve being continued till it crosses the inner rail of the main track, we have for the frog angle the angle which its tangent at this point makes with the main track, or a tangent to it if a curve. Some calculation is therefore necessary.

By the following method we may place a frog anywhere (practicable) in front of the switch and turn-off to it by a curve, without any calculation whatever, except a simple proportion for the ordinate used in bending rails.

Suppose we have a frog on the ground that we must use. We work thus: Place the frog at any convenient position, *F*, fig. 2,

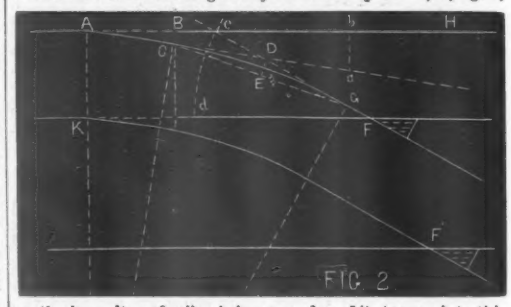


FIG. 2

on the inner line of rails; bring one edge of its tongue into this line; lay off any convenient multiple, *Fd*, of the length of the frog on the inner line, *FK*; swing an arc with this radius and lay off on it the chord *dc* equal to the same number of times the width that *Fd* was of the length of the frog. We thus have *Fc*, the other edge of the frog produced. Now from *A*, the heel of the switch, lay off *Ab*, any multiple of the switch rail, on the outer line *AH*, and *ab*, the same number of times the throw, perpendicular to this. We thus have *Ab* for the switch rail produced. These two lines intersect at *D*. We now measure *DG=DC*, and put in a curve from *C* to *G*. *GF* is straight. The middle ordinate $m = \frac{1}{4} DE$, and the two side ordinates

each $= \frac{1}{4} m$. The curve thus located is a parabola, whose radius of curvature at the point D is shorter than that of a circle tangent at G and C by just the amount m, and whose radius at the tangent point is greater than that of the circle by about $2m$. We may therefore say with sufficient accuracy:

$$\text{Ordinate for rail} = \frac{DE\ (\text{length of rail})^2}{2\ CG^2}.$$

This method is similar to that given by Mr. Trautwine, on page 404 of his new "Civil Engineers' Pocket Book." He, however, works his frog along until by estimation the tangents DC and DE are equal. This is a very uncertain operation, with no better means of producing the edge of the frog than a string laid along it. There can be no objection to the straight piece GF, and it is often desirable to locate our frog at the end of a rail, so that the cut piece shall fall beyond it.

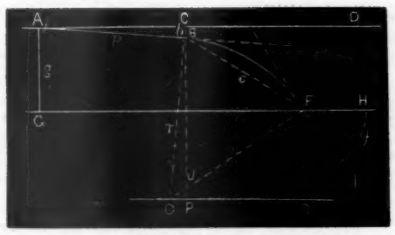
This same *modus operandi* may be used, with slight modifications (readily suggesting themselves to the engineer), on curves.

Practical Field Engineering.

NO. XV.

LOCATING FROGS—FORMULÆ AND EXPLANATIONS.

The following figure is distorted in its proportions in order to exhibit plainly the elements to be taken into consideration in making the calculations for the location of a frog. The elements are: the line AC, the line AB, the chord BF, the line CB, the angle CAB, the angle HFI, the line OB, and the line GA.



In the triangle ACB, right-angled at C, we have:

$$\cos A : \sin A :: AC : CB;$$

therefore, for the purposes of the discussion, we take

$$\frac{AC \sin A}{\cos A} = CB$$

as our first formula and set it aside.

Now let $CB = b$, let $AB = p$, let $AG = g$, let $OB = r$, let $BF = c$, let the angle $HFI = f$, and let the angle $CAB = n$, and the line $AC = m$.

Then, by the figure, taking the above notation, we have

$$m = \sqrt{p^2 - b^2},$$

deduced from the well-known formula

$$p^2 = m^2 + b^2.$$

And we have

$$p : \sqrt{p^2 - b^2} :: r : \frac{r\sqrt{p^2 - b^2}}{p} \text{ (which} = BP)$$

and

$$\frac{r\sqrt{p^2 - b^2}}{p} - (g - b) = FQ.$$

$$\therefore \quad \cos f = \frac{\sqrt{p^2 - b^2}}{p} = \frac{g - b}{r};$$

hence f becomes known.

To find c, we have, from the figure, the angle

$$CJF = JFQ = HFJ = f.$$

We have also

$$CJF = OBJ + JOB, \text{ and } JOB = f - n.$$
$$\tfrac{1}{2}(f + n) = BFG;$$

$$\therefore \quad \frac{g - b}{c} = \sin \tfrac{1}{2}(n + f) \quad \therefore \quad c = \frac{g - b}{\sin \frac{1}{2}(n + f)}$$

which gives us c.

Then to find r, we have

$$\cos f = \cos n - \frac{g - b}{r},$$

and

$$r = \frac{g - b}{\cos n - \cos f}.$$

The angle A being given, the first formula set aside will give b, when AC is known.

Now, in a practical example, the line AB is the switch-rail for a turn-out, CB is the *throw* of the switch, BF is the chord of the arc of the curve between the switch-throw and the frog-angle HFI, AB is tangent to the arc BF, and so also is the line FI.

Now let us apply the formula for finding the frog-angle $HFI = f$, radius, gauge, length of switch-rail and throw being known.

The formula is

$$\cos f = \frac{g - b}{r};$$

then the *gauge minus the throw divided by radius = cosine of frog-angle.*

Let the gauge = 4.7 feet.

Radius = 100 feet.

Throw = 6 inches, and switch-rail = 24 feet.

Then, by formula,

$$\cos f = \frac{g - b}{r} = \frac{r\sqrt{p^2 - b^2}}{p};$$

or, by the figure, since

$$\cos f = \frac{FQ}{OF} = \frac{BP - AG - BC}{r} = \frac{r \cos OBP - (g - b)}{100}$$
$$= \frac{100 \cos OBP - 4.2}{100}.$$

But the natural sine of $OBP = \frac{b}{p}$, since from the figure (the lines AD, GH and OQ being parallel, and the line BP perpendicular to them) $OBP = CAB$.

Then

$$\text{nat sin } CAB = \frac{.5}{24.} = .0208333.$$

Then

$$\text{angle } CAB = 1° 11.625',$$

the cosine of which is .9999943.

Then substituting values we have—

$$\cos f = \frac{99\ 99943 - 4.2}{100} = .9579943,$$

which number is the cosine of 16° 40', as near as may be.

(The formulæ above given necessitate the use of a table of natural sines. I first saw them in a little book by Oliver Byrne.)

But to make the application plain, let us take the formula,

$$r = \frac{g - b}{\cos n - \cos f}.$$

For this purpose let the frog-angle $= f = 16° 40'$.

Let the road-gauge $= g = 4$ feet $8\frac{1}{2}$ inches.

Let the switch-rail $= p = 24$ feet.

Let the throw $= b = 6$ inches.

Required the radius $= r$.

Say 24 feet $= 288$ inches $= 576$ half-inches.

6 inches $= 12$ "

Then

$$\frac{12}{576} = .02083 = \sin 1° 12' \text{ nearly, and } n = 1° 12'.$$

$$\cos 1° 12' = .99978,$$
$$\cos 16° 40' = .95799,$$

and

$$\cos n - \cos f = .99978 - .95799 = .04179.$$

Then as

$g = 4$ ft. $8\frac{1}{2}$ in., and $b = 6$ inches, $g - b = 4$ ft. $2\frac{1}{2}$ in., $= 4.21$ feet,

$$\text{and } r = \frac{4.21 \text{ ft.}}{.04179} = 100 \text{ feet, nearly.}$$

Let us now take the same dimensions and calculate the length of the chord $BF = c$.

The formula, you recollect, is

$$c = \frac{g - b}{\sin \frac{1}{2}(n + f)}. \quad 16' 40' + 1° 12' = 17° 52',$$

one-half of which is

$8' 56'$, the sine of which is .15538.

Then

$$c = \frac{g - b}{\sin \frac{1}{2}(n + f)} = \frac{4.21}{.15528} = 27.11 \text{ feet.}$$

To shorten the calculation, I have used only *five figures* of the table of natural sines. At least *seven* figures should be used.

From the first formula set aside

$$\frac{AC \sin A}{\cos A} = CB,$$

and we also have

$$\cos A \times AB = AC.$$

Say $\cos A = .99999$; then if $AB = 24$ feet, by the formula, $AC = 23.999$ feet, and $CB = .499$ of a foot, which is practically 6 inches. Thus, where AC and the angle at A are given, we can calculate the throw, which is $CB = b$. These examples are enough.

As a general rule, the location of turnouts is left to the section boss or boss track-layer, and the field engineer has little to do with it. Indeed, on a majority of roads, the field engineer's connection with the work ceases as soon as the earthwork and timber or mason-work are completed, and the earthwork rarely includes that for sidings.

HOOSIER.

Something about Check-Chains on Rolling Stock.

DAYTON, O., January 21, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It has always been a matter of surprise to me to find practical railroad men object to check-chains, but I have generally been relieved from that feeling. When I asked, Why do you object to them? they answered that they were of no use, as they would not hold: and that is the most intelligent objection that I have had offered, and I knew of one road—an important one, too—where the Master Car-Builder never put them on at all. From my experience, I would just as soon ship a rudder and go to sea without tiller-ropes or rudder-chains in a large ship as to run my rolling stock without check-chains. It is true that with a perfect track and perfect machinery, which will not break, and where there is no possibility of any obstruction being placed upon the track to throw you off, a check-chain would be useless; but as these conditions are not found in these days, we must prepare for possible contingencies, and if a broken rail, a broken flange, etc., should throw your train off, and no check-chain, you are emphatically at sea without a tiller, tiller-rope or rudder-chain.

Now assuming that this is the fact, and that the objectors can urge no better theory for their disuse than that they don't amount to anything, or will not hold, the simple question is, How shall we make check-chains and fasten them to the rolling stock so that they will hold?

In my observations I have never seen anything in the way of check-chains that I considered adequate to the requirement. They are all too light and fastened too insecurely to the car and truck. A simple hook with two bolts, in the strongest I have ever seen, attach the chain to the outer sill in a perpendicular to the track. This might do if the direction were in the line of strain; but it is not. Consequently the lower bolt is wrenched off, and the upper one receives all of the strain, and is the only one of any value, or which holds under heavy pressure. Sometimes the car-sill is broken.

I have had a number of cases come under my own immediate observation, when the check-chain was all that saved a train from total wreck, and I have also seen cases when the absence of them caused the trucks to slew and make a total wreck of a number of Blue Line cars, piling the trucks up into a heterogeneous mass and shivering the bodies so that they were not of much use, except for kindling wood; and that at moderate speed. I know of many instances when cars and trains were saved from wreck, and when bridges were saved from destruction, by check-chains, and only within the last few days I saw a locomotive loaded upon a locomotive-truck car run off the track, and saved only by the hanging of one bolt each—the upper one of the check-chains—on the car sill.

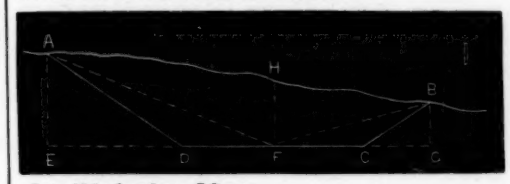
I think that almost any one who has looked into this matter at all will be able to furnish instances of the saving of much life and property by them, and especially on new roads unballasted, when sometimes managers or presidents of roads, too anxious for a dividend, will crowd Blue Line and side-bearing cars upon a road laid in winter and while the frost is coming out—which is unfit for any train or car to run upon—to have their cars ditched or piled up promiscuously from running off the track; the wheels striking obstructions on one side and not being strong enough, the truck on train sometimes lurches too and is made a perfect wreck because the check-chains don't hold.

Now the remedy is simple. Let the check-chains be, first, strong enough not only to suspend the truck but to bear the most violent strain likely to be put upon them; then fasten to the truck securely and to the car-sill with a heavy strap shackle reinforced, put on fore and aft—that is, eight chains to the car—so that the sill shall in no ordinary case be shattered; and with the chains with only play enough to allow for the motion of the truck around curves, with a plate over the car-sill and a rod holding it up, I will venture to say that much property and many lives will be saved to the country.

C. LATIMER.

To Find the Area of any Cross-section.

TO THE EDITOR OF THE RAILROAD GAZETTE:



Let width of roadway $DC = w$.
Let center cut, $HF = c$.
Let cut on left side, $AE = l$;
That on right side, $BG = r$.
Let $EF = a$, and $GF = b$.
Then we shall have:

(1) Area $AHF = \frac{1}{2} HF \times EF = \frac{1}{2} c \times a$;
(2) Area $BHF = \frac{1}{2} HF \times GF = \frac{1}{2} c \times b$;
(3) Area $ADF = \frac{1}{2} DF \times AE = \frac{1}{4} w \times l$;
(4) Area $BCF = \frac{1}{2} CF \times BG = \frac{1}{4} w \times r$;
(5) therefore

Area $ABCD = \frac{1}{2} c \times a + \frac{1}{2} c \times b + \frac{1}{4} w \times l + \frac{1}{4} w \times r$,

(6) which $= \frac{1}{2} c (a + b) + \frac{1}{4} w (l + r)$,

but

$a + b =$ distance between the slopes,

and

$l + r =$ sum of side cuts

Hence, to find the area of any cross-section, add one-half the product of the center cut (or fill), multiplied by the distance between the slope stakes, to one fourth the product of the width of roadway multiplied by the sum of the side cuts (or fills).

Example.—Let $w = 20$ ft., $c = 8$, $r = 6$ and $l = 10$; slopes $1\frac{1}{2}$ to 1: then $a = 25$ and $b = 19$:

therefore $a + b = 44$, and $l + r = 16$, and equation (6) =

becomes $\frac{8}{2} \times 44 + \frac{20}{4} \times 16 = 176 + 80 = 256 =$ area.

If l, c and r are alike, equation (6) becomes $\frac{1}{2} c (a + b + w)$.

F. D.

Inspection of Land-Grant Railroads.

"Another section of twenty miles on the Land-Grant Railroad has been completed and accepted by the Governor," A paragraph similar to the above meets the eye of the general reader not unfrequently in the local papers of some parts of the West. There is nothing in this to excite wonder or surprise, and the only effect it has on the reader is to bring forcibly to mind the rapid progress of Western railroads.

It is somewhat amusing, however, for a "professional" to read a column or two descriptive of the "tour of inspection." "A special train was fitted up for the accommodation of the Governor and his staff, who were also accompanied by a select party of invited friends, some of the officers connected with the line and several pencil drivers." This is all proper. The Governor should be provided with a special train, and his friends should accompany him and the officers of the road, and the representatives of the press should be there. These latter gentlemen must attend, for nothing can be done without them; for it is they who will put the road before the public in a thoroughly finished condition. It is they who perform all the labors of inspection. They pronounce on the excellence of the road, likewise on the cold chicken, champagne and cigars. Usually these gentlemen are more competent to judge of the last-mentioned articles than the former, inasmuch as they are afforded far greater opportunities for inspection of the "commissaries" than for examining into the condition of the road. They are "hustled" over the line as fast as safety will admit, only stopping at stations to hear a little speech-making and offer their congratulations to the friends of the enterprise. One thing noticeable in connection with these official inspections is, that no experts ever accompany the party. Another is, that those who are acting in an official capacity are not permitted to examine culverts, cattle-guards, trestlework, bridges, or, in fact, any structure or superstructure. They do not learn whether the rails are 40 or 60 lbs. to the yard, neither do they know whether there are 1,200 or 2,400 ties to the mile, neither

do they ascertain whether one-half or two-thirds or all of the ties are spiked. They cannot say whether the track is ballasted or not, nor whether the cuttings are of proper width and sloped so as to prevent a disastrous "caving in" at no distant day, and they could not tell you whether the ties were oak or basswood, or what kind of timber the bridges and trestles are built of, or whether the road is fenced or not. They know nothing of the drainage or whether culverts have been built in all places where they are needed, or whether those that are built are of the proper size for safety. In fact, they know nothing of the road whatever. They only know that they have been over the line in a magnificent car drawn by a splendid locomotive, all of which they can describe with a minuteness that is truly astonishing. They know also that the railroad company has a "hankering" after the land that the Legislature has promised them on the completion of the road, and there may be some cash subsidies that are worth looking after. But the land can only be secured by the acceptance of the road by the Governor in behalf of the State, and it was stipulated that the road should be built in a thorough manner, otherwise the company should forfeit all claim to the coveted land. One account states that the official party passed over the road in the night, and returned before daylight, the members occupying comfortable berths in a magnificent sleeping-car. Of course the road was found to be *first-class in every respect*. Another account mentions the fact that the Governor was so pressed with other duties as to preclude the possibility of his personal inspection of a newly completed section, and he deputed a friend (a disciple of Blackstone) to act in an official capacity, which he did, and the road was accepted.

This may in some measure account for the many thousands of miles of miserably-constructed railroads that may be found in the country. If the legislatures and the general government have acted wisely in turning over the public lands to railroad companies as an inducement for them to extend their lines, whereby the resources of the country may be rapidly developed, they should go still farther in the good work and secure for the public what they have a right to demand, *i.e., railroads built for use*—FOR BUSINESS. If the law-makers and law-executors have the good of the public at heart, let them organize a more thorough system of railroad inspection, and let lawyers and doctors attend to their briefs and pills, and leave it to professional railroad men to decide whether the roads are *honestly* built or not. When the official inspection is performed *on foot* by competent men whose decision cannot be bought, we may secure something better than man-traps in exchange for the valuable land that is being so generously sliced off to railroad builders.

WM. S. HUNTINGTON.

Warming and Ventilating Cars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your articles on ventilation of cars have been so exhaustive and so perfect that I hesitate about saying a word, but there are one or two points in that of January 4, that I would like to speak of—as connected with the Chicago, Burlington & Quincy practice. Your argument that the exhaust should be at bottom is convincing, and the facts agree with it. We put four to six ventilators on each side of the "raised roof," and find that they are needed to keep the air in the car fresh. We now put a blind where you in your sketch show a register, and put the register or "valve" inside of the air passage, where it is under *lock* and can be reached only by train-men. In winter this is closed of course, and air goes through the stove. We have a damper between the air inlet and the stove, but have never yet seen the time when *too much air came*—that is, more than could be warmed. With the stoves *untouched* by passengers—and especially with a hot-air flue extending the whole length of the car—we have found that in the hardest winds all the air was warmed. I think the great objection to most stoves is that they are not locked so that passengers—who do not understand the management of them—can not touch them.

ANNUAL REPORTS.

Portland & Ogdensburg.

The annual report of this company gives the receipts of the finished portion of the road for the eleven months ending November 30, 1872, as $115,484.12, of which $50,607.47 was from passengers, $59,326.46 from freight, and $5,550.19 from express, mails and miscellaneous sources. The expenses were $75,123.22, or 65½ per cent. of the receipts, the principal items being as follows: repairs of track, $19,049.91; station expenses, $13,-095.61; repairs of engines and cars, $7,070.82; wages of trainmen, $10,715.15; fuel, $10,650.88; salaries, insurance and taxes, $12,414.40. The road transported 55,592 passengers and 37,856 tons of freight. The gross earnings were at the rate of $1,925 per mile. The net earnings were $40,360 90. The completed portion of the road extends from Portland, Me., west by north to North Conway, N. H., 60 miles, and the road is to extend to Dalton, N. H., 50 miles further, where it will connect with the Vermont Division. Work on the Vermont Division is progressing well, 61 miles, from West Concord through St. Johnsbury to Hyde Park being ready for business. From Hyde Park to Cambridge, 12 miles, and from Cambridge to Sheldon, 19 miles, all the heavy work is done; and from Sheldon to Swanton, 13 miles, the grading is nearly done and four miles of track laid from Swanton east. The 14 miles from West Concord east to the Connecticut River has been put under contract.

Wilmington & Reading.

The annual report for the year ending October 31, 1872, shows that the gross receipts for the year were: from passengers, $52,065.93; freight, $171,939.98; mails, express and miscellaneous, $4,767.34; total, $228,773.25. The operating expenses were: for motive power, machinery, repairs, taxes, etc., $155,-142.06; maintenance of way, $41,964.02; total, $197,106.08. The net earnings were $31,667.17. For the preceding year, the gross earnings were $167,791.97, showing an increase last year of $60,-981.28, or 36¼ per cent. The operating expenses the previous year exceeded the receipts by $10,673.06. The operating expenses were 86½ per cent. of the gross receipts, and the latter were at the rate of $3,575 per mile. The increase in receipts was mainly in the freight traffic, the increase in which over the previous year was about 47 per cent. A large part of the freight traffic is in coal and iron ore, and a large increase of this description of traffic is looked for on the completion of the Berks County road, now under construction.

In addition to the receipts from the road, $358,700 was received from the sale of bonds and $1,334.14 from stock collections, making $360,034.14. Of this amount, $149,338.45 was expended for new construction and equipment, $71,932.37 for depots and buildings on the Reading extension, $14,000 was added to the sinking fund for the first-mortgage bonds, and $153,527.22 was paid for interest.

The road extends from Wilmington, Del., north by west to Birdsboro, Pa., on the Philadelphia & Reading road, a distance of 63.6 miles. An extension from Birdsboro to Reading, 10 miles, is in progress and will be completed during the coming season.

The rumors that the road is about to pass into the hands of the Philadelphia & Reading Company have been emphatically denied by the principal stockholders and directors of the company.

Berks County.

The annual report of the President of this company gives the operations of the company for the year ending October 31, 1872. The surveys of the road have been completed and the line finally located. Owing to the existing difficulties between the Wilmington & Reading and the Philadelphia & Reading companies, it has been deemed best to make the connection with the former road outside of Reading, and a line has been surveyed which reaches that road at Poplar Neck, below the city. This will render necessary the construction of two bridges over the Schuylkill. A spur into the city of Reading will also be built. The contract for the road from Poplar Creek to Lenhartsville has been let, and the work is so far advanced that tracklaying will be commenced in the spring. The contract for the remaining 20 miles will be let shortly. The road will extend from Reading north to Slatington, on the Lehigh Valley road, 33 miles from Easton, and will be 42 miles long.

The receipts thus far have been:

From stock subscriptions		$92,955 00
Interest on bank accounts		731 59
Total		$93,686 59
And the expenditures:		
Engineering and miscellaneous	$12,510 28	
Land damages	4,241 00	
Grading and bridging	35,085 67	
Rails and ties	10,070 12	
Real estate	7,250 00	$69,157 07
Balance		$24,529 52

It has been resolved to issue $1,500,000 in 7 per cent. first-mortgage bonds. These bonds are dated November 1, 1872, and have 30 years to run. A sinking fund is provided for.

Peninsular.

This company, formed by the consolidation of the Peninsular and Peninsular Extension Companies of Michigan, the Peninsular Company of Indiana and the Peninsular Company of Illinois, has a road completed and in operation from Lansing, Mich., southwest to South Bend, Ind., 120 miles. The grading is completed from South Bend to Valparaiso, 45 miles farther, and 25 miles of track has been laid, but none of this section has yet been opened for business. It was originally intended to extend the road to Chicago, but an agreement has been made with the Pennsylvania Company by which all the business of the road is to be carried over the Pittsburgh, Fort Wayne & Chicago road from Valparaiso to Chicago. The receipts for the year 1872 were $109,913.52, and the expenditures $168,252.52, leaving a deficit of $58,339.00. The earnings were at the rate of $916 per mile. The rolling stock of the road consists of only four locomotives, four coaches, one baggage and 46 freight cars, and is entirely insufficient to transport the local business offered. No increase of earnings can be looked for until the road is supplied with sufficient rolling stock. The road transported during the year 83,491 passengers and 46,333 tons of freight.

The report gives a full history of the company from the beginning. Aid to the amount of $283,500 was originally voted to the company, but owing to the adverse decision of the Supreme Court of Michigan only $156,000 of this amount was ever received. The Michigan Company also issued $1,000,000 in bonds. When the different companies were consolidated in 1870, a further issue of $2,000,000 in mortgage bonds was made for the purpose of completing the road. S. W. Hopkins & Co., by promises which were not fulfilled, at one time succeeded in obtaining a controlling interest in the road, but were afterwards obliged to surrender most of the stock and bonds obtained by them, but suits concerning this matter are still pending, and the issue of all the stock, and all but $750,000 of the bonds, is restrained by injunction. Notwithstanding this, an agreement has been made with the Pennsylvania Company by which the road will soon be completed to Valparaiso, and a large increase of business is expected.

Cincinnati & Indianapolis Junction.

Hon. W. D. Griswold, Receiver, has made a report to the court of the operations of this road during the time it was under his control. He took possession November 20, 1871, and surrendered it to the purchasers December 2, 1872, having held it 13 days over one year. During that time the receipts were: from passengers, $120,859.60; freight, $166,456.81; express and mails, $10,084.11; miscellaneous sources, $15,157.66; total, $312,558.18. The expenditures for the same time were: for operating expenses, $319,688.16; taxes, interest, etc., $10,837.71; total, $330,525.87, showing a loss of $17,967.69. The road has never earned its running expenses, and a large balance of debt has accumulated to be paid out of the purchase money. The purchasers (the Cincinnati, Hamilton & Dayton Company) presented first-mortgage bonds and coupons to the amount of $1,315,030, and the Receiver took, as part payment, the receipt of the company for the proportion of the purchase money due to it as owner of the bonds. There still remain bonds and coupons to the amount of $78,660, which will be entitled to a proportionate distribution of the proceeds. The debts incurred by the Receiver have been paid, and there are claims still outstanding for salaries of Receiver, trustees under mortgages and attorneys for the trustees, amounting in all to $38,000.

The road extends from Indianapolis, Ind., east by south, to Hamilton, O., 98 miles.

New York & Oswego Midland.

The report of this company to the State Engineer of New York, for the year ending September 30, 1872, shows that at the date of the report 213 miles of the main road was completed, and the company also had branches amounting in all to 121 miles completed, making in all 334 miles of road then operated. The whole length of the main line from Oswego, N. Y., to Middletown will 248 miles, so that 35 miles still remained to be completed, on which we believe there is some heavy work. The road has been operated so far under a disadvantage, the two ends being separated by an unfinished section in Delaware County. The earnings for the year were: from passengers, $278,980.97; freight, $600,826.36; other sources, $94,983.70; total, $974,791.03. The operating expenses were: for repairs of road and buildings, $232,220.69; repairs of rolling stock, $144,290.40; office and station expenses, fuel, wages, etc., $447,-260.67; total, $823,771.76, or 84½ per cent. of the receipts, leaving the net earnings, $151,019.27. For interest, $506,151.52 was paid, making the total payments other than for construction $1,329,-923.28. The number of miles run by passenger trains was 462,-643, and by freight trains 355,712. The trains carried 772,207 passengers and 370,418 tons of freight, equivalent to 2,308,582 passengers and 24,077,170 tons of freight carried one mile. The company at the date of report owned 74 locomotives, 45 passenger, 40 baggage, mail and express, 740 freight, and 258 coal and construction cars.

During the year $5,696,700.48 was expended in construction, and $1,431,911.35 for equipment, making the whole cost of road and equipment to the date of report $18,496,368.31. The capital stock authorized is $10,000,000, of which $5,872,549.32 was paid in up to date. The whole amount of funded debt was $12,500,-993.57, and of floating debt $474,283.94.

During the year one passenger was injured, two employees killed and seven injured, and six other persons killed and two injured, the last being mainly accidents at crossings. The total number is eight killed and ten injured.

Philadelphia & Reading.

The main line of this road extends from Philadelphia to Pottsville, 98 miles, and it own or leases the Lebanon Valley road from Reading to Harrisburg, 54 miles; the East Pennsylvania, from Reading to Allentown, 36 miles; the Schuylkill & Susquehanna, from Auburn to Dauphin, 54 miles; the Mahanoy & Shamokin Branch, 65 miles; the Little Schuylkill road, 28 miles; the Reading & Columbia road, 39½ miles; the Philadelphia, Germantown & Norristown road, 34 miles, and a number of shorter roads and branches, mainly built for coal traffic. During the year the Catawissa Railroad, from Tamanend to Williamsport, 93 miles, has been leased, and the total mileage is now 715 miles. The total length of single track, including second track and sidings, now worked by the company, is given in the report as 1,385.3. The road, with its branches, is the principal line from Philadelphia to the anthracite coal region of Pennsylvania, and its coal traffic is larger than that of any other road in the country.

The operations for the year ending November 30 have been as follows:

Receipts from passengers		$1,786 962
Freight		2,6e8,030
Coal		7,513,115
Mails		39,913
Miscellaneous sources		97,018
Total gross earnings		$12,125,038
Expenses (66⅔ per cent.)		8,063,542
Net earnings		$4,061,496

The increase in passenger receipts over the previous year was $145,567; in freight receipts, $381,387; decrease in coal receipts, $774,178; decrease in mail and miscellaneous, $190,581. Decrease in gross receipts, $437,805, or 3½ per cent., and in net earnings, $945,444, or 18⅝ per cent. This decrease was mainly due to the low rates of coal freights during the year. The average receipts and cost per ton and passenger, based upon the business of the main line, are given as follows: Receipts per passenger, $2.258; cost, $1.782; receipts per ton of freight, $0.93; cost, $0.658; receipts per ton of coal, $1.544; cost, $1.364. For the year 1871 the average receipts were: per passenger, $2.28; per ton of freight, $1.00; per ton of coal, $1.808; cost per passenger, $1.685; per ton of freight, $0.689; per ton of coal, $1.214. The railroads of the company transported during the year 6,383,991 passengers, 2,891,400 tons (of 2,000 lbs.) of freight, and 6,185,434 tons (of 2,240 lbs.) of coal. The expenses during the year were 66⅔ per cent. of the gross receipts. The earnings of the road, including all the leased lines, were at the rate of $19,185 per mile. The Germantown & Norristown road, which has a large suburban business, carried more than one-half the number of passengers transported, the number carried over that line having been 3,712,316, an increase of 471,-636, or 14⅛ per cent. over the preceding year.

The results of the year's business are stated as follows:

Net earnings		$4,061,496 43
Add balance of interest account, receipts from Philadelphia & Reading Coal & Iron Company, steam colliers, etc., deducting drawbacks of 1871 and loss on the Schuylkill and Susquehanna canals		846,478 47
		$4,907.974 90
Amount to credit of reserved fund		789,555 90
Tax on dividend of January, 1872, deducted in last report, but not paid		57,592 73
Total		$5,755,123 53
From which deduct:		
Interest on bonded debt	$1,694,488 00	
Taxes on interest	82,858 44	
Interest on bonds and mortgages	108,613 44	
Debit balance of renewal fund	90.167 79	
Sinking fund loan of 1847	25,000 00	
		$2,001,127 67
		$3,753,995 86
Dividend of July, 1872, 5 per cent.	$1,710.468 76	
State tax on dividend	85,523 44	
Dividend of 5 per cent., payable January 24, 1873	1,711 808 76	
State tax	85,590 41	
		3,593,391 37
Balance of reserve fund		$160,604 49

The loss on the Schuylkill Canal was $351,265.52, and on the Susquehanna Canal $116,490.08. The net profits of the six steam colliers owned by the company was $117,641.77.

The policy of merging the leased companies in the Philadelphia & Reading Company, and thus doing away with the separate organizations, has been continued. During the year the Mount Carbon, the Port Kennedy and the Schuylkill & Susquehanna companies have been thus merged. The stock owned by the Philadelphia & Reading Company in these companies was not re-issued, but the investment in those roads was carried to the general balance sheet under the head of railroads. During the year, 50,190 shares of stock were issued in exchange for convertible bonds. A loan of $10,500,000 7 per cent. bonds has been issued for the purpose of developing coal lands, building steam colliers, etc., and this loan has all been taken at par without expense to the company.

The Philadelphia & Reading Coal & Iron Company now controls 80,000 acres of coal lands, on which are 98 collieries. Of these 27 are worked by that company, the rest being leased. The tonnage of these lands last year was 3,030,880 tons.

Plans have been perfected for a fleet of additional steam colliers, some of 600 and some of 1,200 tons, the machinery for which will be built in the company's shops. A ship yard is to be built at Port Richmond, where all the repairs on these vessels can be done.

The shops of the company have built 472 freight and passenger and 1,000 eight-wheeled coal cars during the year. The rolling mill at Reading has turned out 20,043 tons of rails in the same time. Steel rails have been laid at the most exposed points where the traffic is heaviest.

The experiment tried by the company of doing all the express business on its lines has, notwithstanding the opposition of the Adams' and other express companies, been so far very successful.

PERSONAL.

—Mr. R. T. Bailey, late Chief Engineer of the Vermont Central, died in Montreal, Canada, January 27. Mr. Bailey had been employed on the construction of the Grand Trunk Railway and on other important works, and was widely known as an engineer of ability and standing.

OLD AND NEW ROADS.

Utah Central.

This road at present extends from Salt Lake City to a junction with the Union Pacific at Ogden. A telegram from Corinne, dated January 25, says that a contract was concluded that day between the company and the citizens by which the road is to be extended to Corinne, "from the nearest point on their road, a distance of three miles." Ogden is 25 miles southeast of Corinne, and there is scarcely any other point on the Utah Central nearer Corinne. Perhaps the Utah Northern was meant. Its junction with the Central Pacific is four miles from Corinne.

Milwaukee, Lake Shore & Western.

The Appleton (Wis.) *Crescent* gives a report that the lease of this road to the Wisconsin Central Company has fallen through, that the rolling stock loaned by the Wisconsin Central to Milwaukee, Lake Shore & Western road has been returned, and that the President of the latter company has gone to New York to secure the funds needed to complete the road from Sheboygan to Manitowoc.

Cleveland & Marietta.

This company purposes to build an extension of the Marietta & Pittsburgh road from Cambridge, O., the present terminus of that road nearly due north to Cleveland, a distance of about 110 miles. The company asks Cleveland to purchase $350,000 of its bonds, in return for which it offers to guarantee the delivery of not less than 100,000 tons of coal in Cleveland at $3.50 per ton.

St. Paul & Nebraska.

The Northern Nebraska Railroad Company has been reorganized under this name and is now said to be controlled by the St. Paul & Sioux City Company. The company purposes to construct three lines, one to a connection with the Omaha & Northwestern, one to Columbus, Neb., and one to the mouth of the Niobrara. These three lines will unite about 15 miles west of Sioux City, Iowa, and use the same track from the point of junction to that town.

Indianapolis & St. Louis.

This company has removed its general offices in St. Louis to the new Republican Building, corner of Chestnut and Third streets.

Walla Walla & Grande Ronde.

The line of this road has been surveyed from Walla Walla, W. T., west to Grande Ronde, Oregon, on the Columbia River. The length of the road is 36 miles, and it is reported that there will be very little heavy work on the line. A railroad from Walla Walla to Wallula, also on the Columbia about 20 miles above Grande Ronde, is partly completed.

North Pacific Narrow Gauge.

This company is making preparations to construct its road from Saucelito, on the north side of San Francisco Bay, as far as Tomales, a distance of 30 miles. No surveys have yet been made beyond Tomales.

Elko & Hamilton.

This road, which is to extend from Elko, Nev., south to Hamilton, 120 miles, and of which six miles was graded some time ago, has, it is said, fallen into the hands of parties who will build the road at once. Messrs. Gilmer & Salisbury, of Salt Lake, represent the new owners.

Texas & Pacific.

The party surveying the line from San Diego to Fort Yuma have reached Fort Yuma, having run through lines through the Carisso Valley to the desert. The line will be continued from Fort Yuma east to the Pima villages.

A San Diego (Cal.) date of January 16 says:

"On Saturday morning last the Board of City Trustees sold at public auction the lands deeded by a former Board to the San Diego & Gila Railroad Company. James A. Evans, Engineer in Chief of the California Division of the road, was the only bidder. The entire tract of 9,000 acres, divided into 160 parcels, was knocked down to him for $160. This gives the Texas & Pacific Railroad Company as complete and thorough title to the lands as they desire."

Atchison, Topeka & Santa Fe.

Surveys are being made for an extension from the Kansas State line west to Pueblo, Colorado. The line follows the valley of the Arkansas.

Bangor & Bucksport.

The contract for the construction of this road from Bangor, Me., south to Bucksport, 16 miles, has been let to John Gowen. The work is to be completed by December 1, 1873.

Chicago, Saginaw & Canada.

This company has filed its articles of association with the Secretary of State of Michigan. The road is to be run from Grand Haven east to St. Clair, a distance of 210 miles. The capital stock will be $4,200,000 and the directors are Edward L. Craw, Frankfort, Mich.; Joseph McChesney, Chicago; Ames C. Barstow, William Cartiss, E. P. Mason, Wm. H. Bradford, Providence, R. I.; John F. Slater, Norwich, Conn.; Rowland Hazard, Providence, R. I.

Denver Pacific.

This company sold of its lands, during the year 1872, 19,242 acres, for $78,489.42, or an average of $4.08 per acre. The total sales of these lands since April, 1870, when they first came to market, has been 93,477 acres, for $378,744.56, for an average of $4.05 per acre.

St. Louis & Southeastern.

This company has its bonds in the market to obtain money to make certain improvements, additions to equipment and a short new line, which may reasonably be expected to very much increase the earning capacity and the traffic of a line now doing better than most new roads. The position of the line is somewhat peculiar, inasmuch as, being a through and very direct line (the shortest) between St. Louis and Nashville, that is a northwest and southeast line, nearly one-half of the road forms a section of the shortest line (almost an air line) between Chicago and Nashville, that is, due north and south; and, at the same time, a large part of the existing line east of St. Louis will make part of a straight east and west line between Louisville and St. Louis. So it will have, without any doubt, through traffic from St. Louis to the East, from St. Louis to the Southeast, and from Chicago to the South. For the first and last there is pretty close competition, but in the second it seems likely to develop a large and profitable traffic, as it will be considerably the shortest line from St. Louis to Nashville, and points beyond, and the experience of the Iron Mountain road since it completed its connection to Columbus proves how much this traffic is worth. The improvements which the new loan will enable the company to make will put the road in condition to do this business with great convenience to shippers and economy to itself. The line has exceptionally good prospects, due largely to skill in designing and adapting it to serve so great a variety of interests, and all at least as well as any competitors can.

Messrs. Winslow & Wilson, in behalf of this company, have made the last payment due to Davidson County, Tenn., for its interest in the Edgefield & Kentucky Railroad. The payment was $100,000 in Tennessee State bonds. The road is now owned by the St. Louis & Southeastern Company, and forms part of its line from St. Louis to Nashville.

Chesapeake & Ohio.

The last rail connecting the eastern and western sections of this great line was laid on the afternoon of the 29th. The last news we had gave the length of the gap as 22 miles.

Chicago & Ohio River.

Articles of association of the Chicago & Ohio River Railway Company, with a capital of $4,000,000, was filed with the Secretary of State of Indiana, January 27. The road is to run from the Ohio River opposite Owensboro, Ky., to a point on the Cincinnati & Terre Haute Railroad, a distance of 150 miles.

Louisville, Cincinnati & Lexington.

The freight earnings of this road in December were 25 per cent. more than in December, 1871, and the working expenses were less by more than 8 per cent.

Keokuk & Kansas City.

The amount of subscriptions to the stock of this company is stated as follows: Clark County, Mo., $200,000; Knox County, $285,000; Chariton County, $100,000; Howard County, $100,000; Macon County, $175,000; private subscriptions, $5,000; Western Construction Company, $2,500,000; total, $3,365,000.

Michigan & Wisconsin Pacific.

This company, recently organized at Hudson, Wis., intends to build a railroad across the State from the mouth of the Menomonee River on Green Bay, west to Hudson on the St. Croix, a distance of about 260 miles. The corporators are: J. Comstock, A. J. Goss, L. North, M. A. Fulton, J. R. Ismon, O. F. Jones, H. A. Taylor, T. D. Hall, P. Q. Boyden and L. P. Wetherby.

North Wisconsin.

Messrs. Baldwin and Humbird, the principal stockholders in the West Wisconsin Company, have purchased this road, which is intended to run from Hudson, Wis., where the West Wisconsin crosses the St. Croix River, north to Superior City on Lake Superior. Twenty miles of the road from Hudson north is completed.

St. Paul & Pacific.

The preliminary steps have been taken toward a large suit against this company in the Circuit Court of the United States at St. Paul, Minn. In 1858 the Minnesota & Pacific Railroad Company, a corporation of Minnesota having a land grant from the General Government, made a deed of trust by which it mortgaged all its property, present and prospective, including the land grant, to Elon Farnsworth of Detroit, Edward P. Coles of New York, and W. H. Welch of Minnesota, as trustees to secure the payment of its first mortgage bonds. The trust deed and bonds were executed in strict conformity with the charter of the company. These bonds were put upon the market, and a large number of them sold and the proceeds used in the purchase of right of way and depot grounds, construction of bridges and grading of about sixty miles of road. Subsequently the road, lands, franchises and property thus mortgaged to secure said bonds came into the possession of the St. Paul & Pacific Railroad Company, and "The First Division of the St. Paul & Pacific Railroad Company," and still later were purchased by the managers of the Northern Pacific Railroad Company, and have been heavily mortgaged by the companies last named for the security of other bonds which are upon the market, and sold upon representation that they are secured by a first lien upon the roads and lands, when, it is charged, in fact the said property is embraced in the unsatisfied mortgages of 1858. The interest on the bonds not having been paid and the debt repudiated, the Trustees now file a bill in chancery in the United States Court to enforce payment of the interest and for foreclosure of the mortgage.

The St. Paul & Pacific Company, the First Division St. Paul & Pacific Company, the Northern Pacific Company, and the Trustees of the mortgages made by the several named companies, are made defendants, and the bill charges that they are selling bonds represented by them to be secured by a *first* mortgage, when in fact they are not, but that the mortgages by which they are secured are upon the same lands and property which are encumbered by the prior mortgage of 1858, are subsequent and secondary liens to it. It is further charged that they are selling the same lands that are embraced in the mortgage of 1858 to settlers who are mostly foreign immigrants, who do not understand our laws or language, and are ignorant of the facts, and to whom they represent that such lands are free from encumbrance, when, in fact, they are encumbered for the whole amount of the outstanding bonds issued under said mortgage of 1858.

The Northern Pacific Company has heretofore stated that the St. Paul & Pacific Company was not purchased by the company, but by certain of its managers. It is, however, possible that the property has, since that statement was made, been transferred to the company.

Chesapeake & Ohio.

The final connection between the eastern and western sections of this road was made at 1 o'clock on the afternoon of January 29, 4,000 feet east of Miller's Ferry, or Hawk's Nest, on New River, West Virginia. A train has passed through from Richmond to Huntington, but it will be several days yet before the road is open for traffic.

Seaboard & Roanoke.

A committee of the Virginia Legislature is now investigating the affairs of this road. It is asserted that the company has evaded the requirement of its charter that no more than ten per cent. should be divided among the stockholders. It is also claimed that the stock has been largely watered without any legal authority. Mr. John M. Robinson, President of the company, is also President of the Richmond, Fredericksburg & Potomac and of the Baltimore Steam Packet Company, which own the "Bay Line" of steamers from Baltimore to Norfolk, and in which the Seaboard & Roanoke Company is a large stockholder. It is alleged that the interests of the Seaboard & Roanoke road and the Bay Line have been unduly promoted at the expense of those of the Richmond, Fredericksburg & Potomac and of the Petersburg road, and that there has been a systematic diversion of freight to Norfolk, which should have gone by way of Richmond. The principal complainant is the Petersburg Railroad Company, which owns the road from Weldon to Petersburg. A large amount of testimony has been taken, but no conclusion has been reached, nor does it seem likely that any will be.

New Jersey Midland.

The affairs of this company would seem to be in a very unsettled state, judging from the numerous reports concerning it. The lease to the New York & Oswego Midland Company provided that the latter company should pay the interest on the stock and seven per cent. on the bonds. The interest on the bonds has been paid, but the dividends on the stock have not. Again, there is a strong feeling among the stockholders against the proposed consolidation of the New Jersey Midland, the Montclair and the Hudson Connecting Railroad Companies, the last named being the company which proposes to build the terminus at Weehawken and the new tunnel through Bergen Hill for the Midland road. It is claimed that while the New Jersey Midland road, 70 miles long, cost only about $4,000,000, or $57,000 per mile; the Montclair, 30 miles long, cost nearly $6,000,000, or $200,000 per mile. Under these circumstances, the Midland people do not care to be so consolidated with the Montclair that the revenues of the former will be absorbed by the payment of interest on the debt of the latter, in the not altogether improbable case that the New York & Oswego Midland Company should be obliged to abandon the lease of the roads. The Paterson (N. J.) *Press* says that the stockholders of the New Jersey Midland Company have been led to consider the expediency of resuming possession of their road and running it themselves. The road might not pay dividends for a time, but there is no doubt that it would develop a large local traffic. The heavy grades on some portions of the road will, however, always be a serious drawback to its use as a part of a competing line for Western freight, and it will not be possible for the road to do a large business of any kind until proper terminal accommodations on the Hudson have been secured.

Laclede & Fort Scott.

It is reported that negotiations are pending with contractors, who propose to give a bond to be approved by the company and the counties, in the sum of $500,000, to John B. Henderson as trustee for the stockholders, creditors and counties, conditioned upon the completion of the road from Lebanon, Mo., to Bolivar within one year, and for the finishing of the whole line within a reasonable time.

Ripley

This company has concluded a contract with the Southern Railway Security Company by the terms of which the latter company is to take and operate the Ripley road as the agent of the Ripley Railroad Company. The Security Company is to advance the money necessary to put the Ripley road in first class order, charging 10 per cent. interest on the money advanced. The Southern Security Company can terminate the contract on giving 30 days' notice and the Ripley company on giving the same notice and repaying the money advanced. The road, which is of three-feet gauge, extends from Middleton, Tenn., on the Memphis & Charleston road, south 26 miles to Ripley, Miss.

Utica & Black River.

The opening of the Philadelphia extension has, it is said, been delayed by an injunction issued at the instance of the Rome, Watertown and Ogdensburg Company. It is claimed that the point where the new extension crosses the Ogdensburg road is beyond the point to which the Utica & Black River company is authorized by its charter to build a road. The extension is all completed, with the exception of a few feet necessary to complete the crossing of the Rome, Watertown & Ogdensburg road.

New York Central & Hudson River.

This company has concluded a contract for 10,000 tons of coal, to be delivered in Utica at the rate of 200 tons per day by the Delaware, Lackawanna & Western Railroad Company.

Montgomery & New Hope.

A bill has been passed by the Pennsylvania Legislature authorizing this company to extend its road to and across the Delaware, to a connection with the Belvidere, Delaware and Flemington roads in New Jersey.

Boone County & Jefferson.

This road, which extends from Centralia on the St. Louis, Kansas City & Northern road, 122 miles from St. Louis, south 22 miles to Columbia, Mo., is to be sold under foreclosure of mortgage April 23, 1873. The bonds amount to $300,000, and no interest has been paid for some time. The road is now operated under a temporary lease by the St. Louis, Kansas City & Northern Compa.

Detroit & Bay City.

Track has been laid on the northern end from Bay City to Vassar, Mich., 22 miles. The bridge over Cass River at Vassar is completed, and track-laying is going on between Vassar and Lapeer, the present terminus of the southern section.

Defiance & Indianapolis.

This company proposes to build a railroad from some point on the Toledo, Wabash & Western road in Defiance County, O., southwest to Decatur, Ind., about thirty-five miles. The corporators are: Henry Kahls, Edwin Phelps, P. Bufflington, Virgil Squires, Adam Wilhelm and A. S. Latty.

St. Paul & Chicago.

In the injunction case to restrain the issue of $85,000 in bonds voted to this company by Red Wing, Minn., the court has decided that the injunction must be maintained. The case will be appealed to the Supreme Court of the State.

People's Narrow Gauge.

A company by the above name proposes to build a narrow-gauge road from Cedar Falls, Ia., by way of Eldora and Tipton to Davenport, about 120 miles.

Varna, Peru, Mendota & State Line.

This newly-organized company proposes to build a railroad from Varna, in Marshall County, Ill., on the Western Division of the Chicago & Alton road, northwest through Peru, Mendota and Woodstock to the State line in McHenry County, a distance of 115 miles.

Chicago & Ohio River.

This company has filed its articles of incorporation with the Secretary of State of Indiana. The capital stock is to be $4,000,000, and the road is to run from a point on the Ohio River opposite Owensboro, Ky., through Dubois and Daviess and through either Greene and Clay or Sullivan counties to a point near where the Cincinnati & Terre Haute road crosses White River, a distance of 150 miles. The directors are Henry D. Scott, John S. Alexander, Lenius A. Barnett, Luke T. Brien, Samuel Magill and George Dug.

Erie & Genesee Valley.

Work will soon be commenced on the extension from Dansville, N. Y., south to Burns', on the Buffalo Division of the Erie road. The extension will be constructed by the Erie Company, which operates the road.

Costa Rica.

Work on the Costa Rica Railroad is progressing well. Much of the masonry is done, and some track has been laid on the Lemon or eastern end of the road and a locomotive and construction train put on the track. About 700 men are employed on the work.

Port Royal.

The track has been laid to Upper Three Runs, S. C., seven miles beyond the last point reported and 89 miles from Beaufort. Only 12 miles of track remains to be laid to reach the Savannah at Sand Bar Ferry. The bridge at that point is very nearly finished, and it is hoped that the road will be completed by March 1.

Quincy Bridge.

The report made of the business passing the bridge over the Mississippi at Quincy, Ill., shows that during the year 1872, 5,900 trains passed over the bridge, of which 4,067 belonged to the Hannibal & St. Joseph, 1,304 to the Mississippi Valley & Western and 589 to the Quincy, Missouri & Pacific road. During the year 2,076 steamboats, 885 barges and 341 rafts passed through the draw.

[Continued on page 59.]

RAILROAD GAZETTE

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

THE TENDENCY OF FREIGHT RATES.

There probably has been no time in the history of American railroads, except perhaps in the winter of 1865–6, when there has been so general a complaint of the cost of transportation. Complaints are common enough at all times, it is true, and railroad companies, like other corporations and individuals, are perhaps too little inclined to pay attention to them. So large a part of them are groundless, or based on gross errors, and, more than all, so many indulge in a complaining habit, without knowing or caring as to the grounds of their asserted grievances, that those whose conduct is decried not untrequently do their work in their own way, and take no pains to show why they continue in a course which makes them so many enemies. This is not unnatural, but it is not always wise. In a reasonably intelligent community where the sentiment of justice prevails, unreasonable complaints are not likely to be persisted in when it has been shown that there is no foundation for them.

That there should be now exceptionally loud complaints of the charges for transportation is easily understood. The prices of grain, and especially of corn, which is the grain most affected by the cost of transportation, are lower than for many years—lower even, we believe, than in 1865–66, when similar causes produced similar results, and an exceptionally large corn crop, together with exceptionally low prices, filled the Western newspapers with denunciations of railroad companies, and called together farmers in numerous conventions to devise ways and means for lessening the charges incurred in moving their crops to the seaboard.

Last week we considered the question as to how far the charges of transportation are increased by the dividends paid to shareholders, and we showed pretty conclusively, as it appears to us, that these dividends, whether reasonable or unreasonable in amount, do not largely affect the price of grain; and that by far the largest element in the *price* of transportation is its *bona fide* cost. We also expressed our belief that a reduction in this necessary cost will be possible, through certain improvements and the growth of traffic, and that it will be made, and that in such reduction of cost is the only hope of any considerable reduction of rates, such as will add materially to the price the farmer receives for his grain.

This is a most important question, and on its favorable solution depends very largely the prosperity and future progress of immense tracts of fertile territory in the West, now uncultivated. Immigration has reached districts five hundred and a thousand miles distant from the lakes, and the cost of transporting the heavier agricultural staples from the more distant districts almost or quite prohibits their production for export. Close to the lakes, even, in winter especially, the cost of carrying a bushel of corn to New York is more than the farmer gets for it, and this extraordinarily productive year leaves many farmers poor with magnificent harvests. Relief is needed: that is undoubted. It is worth our while, therefore, to ascertain what reason we have, or if we have any reason, for believing that time will bring relief.

Transportation by railroad is, comparatively speaking, a new business, by no means arrived at perfection as yet. Moreover, one very large element in the cost of such transportation—the interest charged on permanent way—does not increase in proportion to the traffic, but, after a certain point, hardly at all or very slowly. The road which does a business of $30,000 a mile probably makes four times as great profits with average rates one-half or one-third as great as the one which does a business of $7,500 a mile. Improvements in transportation, then, and the growth of traffic on the various lines, we assign as causes why, other things being equal, there is likely to be a progressive decrease in the *cost* of transportation to the companies.

But no inferences from these facts will be half so convincing as the records of experience. Let us turn to these and ascertain what the tendency of freight rates has been: from this we may reasonably infer what it will be.

It is necessary, then, to make some investigations into the history of freight rates. The material for such a history, we regret to say, seems to be very meagre. Most of the companies seem to have kept no permanent record of their tariffs from the beginning, and our investigations must necessarily begin with a comparatively recent date. This is the less to be regretted, however, for our present purpose, because the war and the inflation of the currency so changed the values represented by dollars and cents, for some time, that no fair comparison could be made, and, moreover, because we care more to know what the tendency of rates has been since the war than what it was before or during the war.

We have succeeded in finding files of tariffs, supposed to be complete, from Chicago to New York, from March 28, 1864, to date, and from New York to Chicago, from May 6, 1867, to date. The latter gives eighteen different tariffs; the former no less than eighty-five. We have carefully reduced from these the average tariff for each year—that is, the tariff which, if an equal amount were shipped each day of the year, would produce the same sum as the actual tariffs. This, we should say to begin with, is not the true average tariff, which would be found by adding together the products found by multiplying by each rate the number of hundreds shipped at that rate, and dividing the sum by the whole number of hundreds shipped. There being, however, no record of the amounts shipped under each tariff, this true average cannot be ascertained. As by far the larger part of the shipments are made at the lower rates, the true average would be much less than what we may call the "day average." But as we are now investigating the tendency of rates, rather than their average amount, this difference is comparatively unimportant; and the progress of rates will be indicated nearly with exactness by the average rates which we give for each year.

Average Rate for Each Class of Freight from Chicago to New York for Each Year from 1864 to 1872, inclusive.

Year.	1st class.	2d class.	3d class.	4th class.
1864	1.98	1.58	1.22½	91½
1865	1.95¼	1.63½	1.45½	1.10¼
1866	1.83½	1.61⅜	1.10½	77
1867	1.84½	1.56¼	1.06	73¼
1868	1.85	1.46½	1 04	80
1869	1.63	1.28	83¾	54½
1870	1.60	1.25	84¼	48¼
1871	1.60	1.25	85	53¼
1872	1.60	1.25	85	58¼

We see from this that while there has not been a regularly progressive reduction in rates, they having been higher for certain years than for the year immediately preceding, for the whole period there has been a reduction, and a large one. This is equivalent, since 1864, to 24¼ per cent. on first-class, 20¾ per cent. on second-class, 30¼ per cent. on third-class, and 36 per cent. on fourth-class freights. But as in 1864 and 1865 the cost and price of transportation were likely to be affected more or less by war prices, it will be better to begin our comparison with 1866, and then the progress in rates will appear as follows:

	Average rate.			
	1866.	1872.	Decrease.	Per cent. of Dec.
First class	1.83½	1.60	23½	12.8
Second class	1.61⅜	1.25	36½	22.7
Third class	1.10½	85	25½	23
Fourth class	77	58⅜	18½	24.8

Certainly this is encouraging progress in reduction; and, what is remarkable (because these lower classes have always left a narrow margin of profit) is that the reduction has been greatest on the coarse freights, which form probably five-sixths or more of the total freights eastward. The lowest class, which is usually the same as the special rate for grain in bulk (but sometimes a little higher) has doubtless at times touched figures too low to be profitable, and we see that there has been a considerable advance in these rates since 1870. It is also noticeable, and on the surface perhaps discouraging, that rates in this direction have been almost uniform since 1868. But when we reflect that during that period there was a great and unforseen increase in traffic without a corresponding increase in road accommodation and rolling stock—that is, for three years the demand for transportation has grown faster than the supply and exceeded it (a state of things not likely to last another year), we find this arrest of the progress of reduction sufficiently explained.

The figures given above are, of course, the regular rates, and these may have been more or less affected in different years by concessions to shippers and "breaks" in rates. Concessions, however, are likely to have been pretty regular, and while, if they could be ascertained and allowed for, the average rates would appear lower, they would hardly affect the *progress* of rates downward; and "breaks" in rates, when regular rates are not adhered to, and in fact do not exist, are extremely infrequent in east-bound business.

We have considered the history of rates eastward first because this is much the most important traffic—at least much the bulkiest—and that which most affects the prices of commodities. But of course any record will be incomplete and any inductions defective which do not take into account the rates in both directions. We have, as we have said, no records of tariffs westward previous to March, 1867 (our first is dated March 28), but for reasons heretofore given rates previous to 1866 would hardly be of service in making comparisons, and the progress is very clearly shown by the six years reported. In this, however, the regular rates are so frequently broken by competition, and the periods during which enormous reductions were made on regular rates of all classes are so numerous and so long, that the true average rates received must have been in some years very much less than the figures we give. Still, as these "breaks" have occurred almost every year, the *progress* of rates will be shown quite correctly by the figures of the tariffs.

Average Rate for Each Class of Freight from New York to Chicago for Each Year from 1867 to 1872, inclusive.

Year.	1st class.	2d class.	3d class.	4th class.	Special.
1867	1.91	1.62½	1.29½	.83	....
1868	1.91¾	1.62	1.32	.84	.87½
1869	1.73¾	1.55½	1.23½	.82	.85½
1870	1.50½	1.30	1.00	.76¾	.55
1871	1 54	1.32	1 02	.77¼	.55½
1872	1.17¾	.98¼	81	.62	.48⅜

The average rates at the beginning and end of the period considered, together with the decrease and percentage of decrease in the six years, are shown below:

	Rate in 1867.	Rate in 1872.	Decrease.	Per cent. of Dec.
First class	1.91	1.17¾	73¼	38¼
Second class	1.62½	98¼	64¼	39½
Third class	1.29½	81	48½	37½
Fourth class	83	62	21	25¼
	In 1868.			
Special class	57½	48⅜	9⅜	16¼

The reduction in these rates is seen to be enormous, and has been much more rapid and regular than the reduction in east-bound rates, the cause for which is not far to seek. The bulk of traffic bound east is very much greater than that bound west, and the number of cars unloaded in the East which must go back empty increases constantly. It is natural and proper, therefore, that great concessions should be made to obtain loads for these cars, which must be hauled back, full or empty. The difference now between rates east and west are much greater than they were in 1867, as will appear by an inspection of the above tables, by which it appears that rates in the two directions in 1867 and 1872 were as follows:

	1867.			1872.		
	East.	West.	Difference.	East.	West.	Diff'nce.
1st class	1.84½	1.91	+ 6½	1.60	1.17¾	— 4.¼
2d class	1.56¼	1.62½	+ 5¼	1.25	.98¼	— 26¾
3d class	1.06	1.29½	+ 23½	.85	.81	— 4
4th class	.73¾	.83	+ 9¼	.58¾	.62	+ 3¼

Thus it appears that on all classes the average regular rates in 1867 were greater on west-bound than on east-bound freight. As, however, the former average was very much more diminished than the latter by irregular rates and concessions to shippers, it is not probable that the average rates received were greater in that direction. In 1872 rates on the two higher classes were respectively 26 per cent. and 21 per cent. lower on west-bound freight.

If we take the mean between the averages in each direction as the average of all the freight carried, we will find the reduction since 1867 to have been 48.9 cents per hundred, or 26 per cent., on first-class freight; 47.6 cents per hundred, or 30 per cent., on second-class freight; 34¼ cents per hundred, or 29 per cent., on third-class, and 18 cents per hundred, or 23 per cent., on fourth class.

This progress seems to us very creditable on its face. It is the more so when we consider the circumstances under which it has been made. For during this period there has been no decrease in any of the elements which enter largely into the cost of transportation. The chief of these are labor, fuel and iron. There have been no considerable changes in the prices of the first two of these elements since 1867, we believe, except locally; but the latter within eighteen months past has increased in price enormously, advancing largely the cost of nearly all the chief materials used on railroads, and by so much increasing the cost of transportation. That under these circumstances there has been so large a decrease in the price of transportation is a striking proof of the progress made in that business, and an indication of what may be hoped from it in the future. In the period since the war, while there has been no general decrease in prices, and a notable increase in the chief material consumed by railroad companies, there has been, we see, a very large decrease in the prices for carrying freight, and a larger decrease, we think we may safely say, than there has been in the price of any other service which closely affects the community generally. Although in one direction this progress seems to have been arrested of late, we believe that its arrest will be temporary only, if the circumstances which have made the past decrease possible shall continue in the future. These are, chiefly, the continued rapid growth in the amount of traffic, and, what is still more important, *the increase in traffic on existing lines.* The railroad can carry at less cost only by carrying more. The trunk lines are nearly ready to carry very much more than ever before. The only probable contingency which may keep down their traffic and keep up their rates is the diversion of the new traffic to new routes to such an extent as to prevent any increase on the old ones.

Just how far the cost of carriage may be decreased by the increase in amount on a single line it is impossible to estimate exactly. It is safe to say, however, that the limit of decrease will not be reached with only traffic enough for a double-track road. Freight tracks for general traffic we have had no experience with in this country (several coal roads have such tracks), and though there is no doubt that such tracks with traffic enough to keep them pretty constantly occupied would very much reduce the cost of carriage, the amount of such reduction we probably will never know until we have tried, as we are likely to very soon. In this and similar improvements, and in the improvement of the water routes to the East, however, lie the possibilities of a large reduction in the transportation tax between the East and the West.

ECONOMY IN TRACK REPAIRS.

With the extension of the railroad system, it becomes more and more important that the laws which determine the economical operation of such roads should be clearly understood, and to do so it will be necessary to adopt thorough and systematic methods of collecting statistics, and to employ a high order of scientific skill in analyzing and directing such investigations. It seems probable that the day may be not very remote when the roads which are thus managed will be profitable, while those which drift along without knowing exactly what they are doing will not be. At the present time, there are so many methods of securing exclusive privileges by unjust and venal legislation, and by the employment of the mere brute force of capital, or unscrupulous combinations of interests opposed often to those of the public, and intended to defraud the latter, that comparatively little actual competition in the *economy* of railroad operations has been developed. With the extension of railroads, questions of economy will present themselves more and more; and as the subject becomes better understood, it will be learned that skill is very much more effective in reducing expenditures than merely altering the figures of pay rolls. The latter method has, however, the advantage of being quite within the range of the capacity of the poorest executive officer, whereas discriminating between men of ability and those without is a much more difficult task.

These reflections were suggested by the unusual number of accidents which have occurred during the past month, and which have been caused by broken rails or other defects in the track. Travelers from the West especially, bring the most unfavorable reports of the condition of the permanent way of many of the roads over which they travel, and railroad men attribute the loss of life and limb to broken rails with as much calmness and apparent confidence that for such causes they are not responsible as a pious Christian manifests in the decrees of a "special Providence." A gentleman who has had much experience in traveling; who was one of an exploring party through Alaska in winter, and who has just returned from a journey to and from Omaha, has assured us that of the two he would prefer to encounter the discomforts and perils of traveling in sledges in that far-off country to those which he endured on railroads between New York and the enterprising western city referred to. It may be that the recollection of what he encountered years ago was less vivid than that of his experience only last week; but such was his testimony, and as part of one of the trains in which he had traveled had been turned upside down, there seemed to be some reason for his holding such sentiments. He stated that, considering the condition in which he found some of the roads, the matter of surprise was that there were not more accidents. No other testimony is needed with reference to the bad condition of the tracks of many of our roads at this season of the year than an appeal to the experience of those who travel. The inquiry, then, quite naturally suggests itself, whether it is economical to keep a road-bed in bad condition, and also what relation there is between the cost of repairs of a road and that of the repairs of machinery.

It is not our purpose to attempt to give any very definite information with reference to these points, but only to present the need of such knowledge, and, if possible, suggest the direction and methods of inquiry, and to solicit from railroad managers contributions of information and experience for the benefit of our readers.

That the injury to machinery from running over a rough track is greater than that from running over one which is in good condition, of course needs no demonstration; but whether the cost of repairing the injury done to engines and cars is greater than that of keeping the track in any given condition, is a very nice question, and one involving quite complicated problems. There can be no question, for example, that the breakage of rails is due chiefly to a deficiency of material to resist the strains imposed upon them, and to inferior quality of the metal of which they are made.

If a road which is carrying a very light traffic at slow speeds and over which only one train a day is run were laid with 40-lb. rails, the track unballasted and in a bad state of repair, obviously the wear and injury to the daily train would be greater than if the rails weighed 60 lbs. per yard, and the track were thoroughly drained and ballasted with broken stone, the joints of the rails secured with the best fastenings, and the whole put in a state of the most thorough repair. It is quite certain though, that it costs a great deal less to repair the cars which run over the inferior track, than it would to maintain the more costly one we have described. On the other hand it is quite certain, that for a road like the Pennsylvania or the New York Central, which is crowded with trains, some of them running at high speeds, a track even more expensive than that last described, and kept up by the most efficient and thorough repair, is more economical than one which would subject every locomotive and car to undue strains. Between these two extreme cases, there is, of course, every shade of variation, and the problem which we now present to our readers for solution is *How much money is it economical to spend upon the track for a given amount and under certain conditions of traffic.* We are now leaving out of consideration entirely the question of security to life and limb, although we believe that an inquiry might also with justice be made regarding the expenditure which would be justified to protect life.

At the present time most railroad managers seem to have very indefinite ideas regarding the economy of track repairs, and any information concerning it would be valuable. As we have already stated, the question is attended with many difficulties and complications, and it will require considerable accurate analysis to determine just the kind of evidence needed to make the subject clear, and then very skillful deductions to arrive at any certain conclusion. Many of our readers will, no doubt, be able to recall instances of broken rails or defective frogs which caused repeated fractures to wheels and axles, and many master mechanics, doubtless, could give sorry accounts of their experience in keeping up the repairs of machinery on new roads and the expense attending it. For purposes of comparison, such experience has, however, little value, because it is almost impossible to tell whether the machinery of these roads in which the expense of repair was least was of the same general character and working under the same conditions. If the accounts of roads were kept with a sufficient degree of accuracy, so that comparison could be made from a large number of the relative cost of the repairs of track and of machinery through a series of years, it might shed some light on the subject, but the great changes of values which, thanks to our paper currency, have been so great and so frequent during the past ten years, makes such a comparison extremely difficult and unreliable.

Probably some valuable conclusions could be evolved if the subject were considered more in detail. If the road masters would carefully test the tensile and the transverse strength and the hardness of rails, and keep a careful record of each test, the cost, the endurance and the amount of traffic carried, and the breakages of all the rails laid, it would give much information regarding the value in service rendered in each special case. It would certainly not involve much labor if each rail was marked the day it was laid, and a record kept, not only of the time when it was first put down, but also when it was taken up, either for repairs or after being entirely worn out. If such an experiment were carefully tried on a large scale on some road, it would shed a great deal of light on the much vexed question of the life of rails, and if different qualities, as indicated by actual tests, were used, it would enable engineers to determine with some accuracy how much each quality is worth in actual service rendered.

If it were possible to make a comparison of the cost of repairs of machinery with those of the road, on a number of lines working under similar circumstances and conditions, it might be some indication of the relation the one bears to the other, especially if such reports were for a term of ten or more years. One difficulty of doing this, however, is that it is almost impossible to separate the cost of *repairs* of machinery from that applied to the construction of new work. If there is much spent on the track the machinery should cost little, and if the track is neglected the expenses of repairs of machinery will naturally increase. There are, however, so many circumstances which influence the question that it is extremely difficult to determine the relation which the one bears to the other. On the Erie road, for example, the track expenses per train mile for the year 1870, according to the State Engineer's Report, were 21.1 cents.* The cost of repairs of rolling stock was 21 0 cents per train mile. On the New York Central the track cost 19.8 cents and the machinery 27.8 cents. The Erie, however, has much sharper curves, which increase the cost of repairs of the track and the rolling stock. Both the machinery and the morals of those who controlled the road at that time were in a wretched condition, so that the expenses were probably higher than they should have been.

* This does not include the cost of new rails.

What is needed is some accurate data regarding the cost of repairs of track and rolling stock per train mile, so as to learn the relation which the one bears to the other under similar circumstances. We will be glad to receive from any of our readers any information which will throw any light on this subject and will enable railroad managers to determine with some degree of accuracy the influence which the one has upon the other.

To Master Mechanics.

The attention of the members of the Master Mechanics' Association is called to the circulars on another page. Both the subjects to which they refer are very important, and are worthy of immediate attention. We have frequently taken occasion to say that the value of this Association will depend almost entirely upon the amount of useful information which is presented in the reports of the committees, and in the discussions at the time they are presented for consideration. If the members neglect to communicate their knowledge, the meetings and the proceedings will soon become "flat, stale and unprofitable," and the Society will go to pieces for the want of coherence.

It is, we believe, quite within bounds to say that it has already achieved the reputation of being one of the most active and useful engineering societies in this country. The fact that superintendents have organized a similar national society is evidence that they have recognized the value of the work done and the method of doing it which has been adopted by the Master Mechanics' Association.

The reputation which the latter has gained can certainly not be sustained by members making of it a mutual admiration society. For this reason they should realize clearly that the success of their Association is dependent upon what they do and not upon what they intend to do. There are some very knotty problems presented for consideration which need very much to be solved; and if the members suppose that mere idle reflections thereon, without some careful thought and investigation, will solve them, they will make a sad mistake.

In answering the circulars, members should bear in mind that their own individual opinions have, scientifically, but little value. If a master mechanic should assert, no matter how strongly, that in his opinion car axles are too small next the hub of the wheel, it would receive hardly any attention at all; but if he would report from actual observation that 90 per cent. of the broken axles were fractured at that point, almost every technical journal in this country and Europe would copy his statement.

Those who occupy positions as master mechanics have rare opportunities for observing the operation of ma-

chinery, and can, if they will only keep their eyes open, make reports which will be immensely valuable.

The Association has a very useful future before it, unless the members should neglect their duty to it, the committees grow careless or allow any other motives than a desire to know the truth, such as may blind their eyes or corrupt their hearts. The meetings and the reports of the Association have already elevated the standing of the men who have the care of the most important branch of railroad management. If, therefore, the members want to make their report what it should be, let them give some labor to the work laid out for them by the committees.

The Price of Iron.

The price of iron has so great an influence not only on the cost of new railroads, but on the working and maintenance expenses of all old ones, that a consideration of the state of the market and its probable future is well worth serious study. Material for this is furnished by the returns of the British Board of Trade for the year 1872; for though Great Britain is by no means our sole source of supply, its production is still so much greater than that of any other country and beyond comparison with that of any other exporting country that it goes very far to establish prices throughout the world.

The enormous increase in the price of iron within the past two years has no precedent in the history of the trade. Since 1857 and until 1871 the fluctuations in the average annual prices of Scotch pig, which may be taken to represent a standard material, were between 49s. 3d. and 60s. 6d., the average in 1858, the beginning of the period, being 51s. 5d., and that of 1870, its close, 51s. 4d., and the average for the entire 13 years was 54s. 2d.

The rapid increase in prices began in 1871, and though the average of this year was only 58s. 11d., the average of one of its months was 70s. But the movement then established continued until October of 1872, and the average of the latter year was no less than 101s. 10d.—an increase of no less than 75 per cent. over the exceptionally high average price of the preceeding year, and the average of one month of 1872 was 129s.—a price not even approached since 1845, when for one month it was 107s. 6d.

The highest mark in this movement has doubtless been passed, and the last year closed with prices which, though 96 per cent. greater than at the opening of the year, were yet 16⅔ per cent. less than the highest price of the year. An English exchange publishes the following statement of the prices of three leading staples at the beginning and culmination of the rise and at the close of 1872, as follows:

	March 8, 1871.	Highest Sept. 18, 1871.	Close of year 1872
Scotch Pig—			
Price	£3 1s. 0d.	£8 5s. 0d.	£6 17s. 6d.
Increase	----------	170 per cent.	125 per cent.
Welsh Rails—			
Price	£6 15s. 0d.	£12 10s. 0d.	£12 10s. 0d.
Increase	----------	85 per cent.	85 per cent.
South Staffordshire Boiler Plates—			
Price	£9 10s. 0d.	£21 0s. 0d.	£16 0s. 0d.
Increase	----------	121 per cent.	68 per cent.

One thing evident from this is that the cost of *working* iron cannot have very largely increased, in spite of the great rise in coal and the general and considerable rise in labor. The margin between pig iron and rails has fluctuated comparatively little, being £3 14s. at the first date named, £4 5s., or less than 15 per cent. more, at the second date, when pig had advanced 170 per cent., and £5 2s. 6d. more at the close of the year, rails having kept up after the decline in pig.

At the close of the year, notwithstanding the decline, the price of pig was 35 per cent. higher than the average of the year, and considerably more than twice as great as the average of 1871, so we begin the year with the prices more unfavorable to railroad companies than they have ever been before at this season.

As to the prospect of a continuance of prices, we have these acts to guide us: Notwithstanding the enormous prices of last year, there has been a considerable decrease in production, and the stock on hand at the close of the year was the smallest known for years. A great strike in one of the leading iron districts is likely, also, to have at least a temporary effect in keeping up and enhancing prices, and though doubtless the existing rates have largely affected the demand, prices continue firm, and manufacturers at least are confident that there will be no further reduction.

Record of New Railroad Construction.

In this number of the RAILROAD GAZETTE information is given of the laying of track on new roads, as follows:

Chesapeake & Ohio.—Completed, January 29, by the laying of 22 miles of track on the gap beiween the eastern and western sections. *Portland & Ogdensburg—Vermont Division.*—Track laid from Swanton, Vt. (near the northeast corner of the State and nine miles above St. Albans), eastward 4 miles. *Peninsular.*—Extended from a point 16 miles west of South Bend, Ind., westward 9 miles. *International & Great Northern.*—Extended from Kilgore northeast 12 miles to a junction with the Texas & Pacific at Longview, Texas. *Missisquoi & Clyde Rivers.*—On this line between Richford and Newport, Vt., a small part of which is in Canada, 22 miles of track has been laid. *Port Royal.*—Extended northwestward 7 miles to Upper Three Runs, S. C., 89 miles from Beaufort. *Indiana & Illinois Central.*—Track laid from Montgomery, Ind., westward 10 miles into Illinois. *Chicago & Northwestern—Madison Extension.*—The western section of the road has been extended 5 miles nearly to Tunnel No. 3, about 9 miles east of Sparta., Wis. *Mercer & Somerset.*—Extended from Pennington north by east 5 miles to Hopewell, N. J. *Houston & Texas Central.*—Extended from Van Alstyne, Texas, north 8 miles. *Detroit & Bay City.*—Completed from the northern terminus at Bay City southward 22 miles to Vassar, Mich. *Cleveland, Mount Vernon & Delaware.*—Extended 14 miles to Sunbury, O.

This is a total of 140 miles of new railroad.

A TUNNEL AT CAIRO is proposed to pass under the Mississippi, and, perhaps, by a branch, the Ohio also, and so connect the railroads of Illinois with those south of the Ohio and west of the Mississippi. There are at present but two railroads completed to Cairo north of the Ohio, and none south of it or west of the Mississippi; but the Cairo & Fulton is to be rebuilt to Bird's Point (on the Missouri shore west of Cairo), we believe, and an extension of the Mississippi Central from Jackson, Tenn., to the Ohio is under contract, and as both streams are wide at Cairo, not easily bridged for want of banks and the great number of vessels passing, and not always easily ferried, a tunnel would be a great help to traffic, whether or no it would be profitable. The work doubtless is practicable, but costly, and if completed it may do much to establish the importance of Cairo, as railroads might be diverted from crossings at other points on either river in order to secure the safe one at Cairo.

A company to construct such a tunnel has been formed, with capital stock amounting to ten millions, and has applied to Congress for a charter. As a tunnel, unlike a bridge, cannot possibly interfere with navigation, it is not probable that any one will object to its construction. Officers of the Pennsylvania Company and of the Cairo & Vincennes Railroad Company are named among the supporters of the project, which would be, we should say, much more costly than the proposed Detroit Tunnel, and, of course, for some years at least, with very much less traffic to support it.

THE TEA TRADE, which the Pacific railroads (before they were completed) were to "revolutionize," although by no means entirely or chiefly diverted to the overland route, has really afforded a considerable traffic to the railroads across the continent. The total imports of the United States in 1872 were 64,847,152 pounds. Of this 3,319,112 pounds was for consumption on the Pacific coast; but of the remaining 61,528,040 pounds, 12,106,421 pounds was received at San Francisco and shipped eastward over the Central and Union Pacific railroads. This is nearly one-fifth of the whole, and would be extremely satisfactory for so new a traffic were it not that the previous year these roads carried 17,845,008 pounds out of 60,508,814 pounds consumed east of the Rocky Mountains, or 29½ per cent. of the whole amount. In 1871 this article supplied freight for about a thousand cars from San Francisco to Omaha; in 1872 675 cars were sufficient to carry it. Carrying in competition with vessels on the ocean sea, the rates are necessarily low (five cents a pound from San Francisco to New York, we believe), but probably enough to leave a small margin over expenses.

THE "NEW JERSEY COMPANY," which was chartered last year by the Legislature of New Jersey, has authority to take from the Pennsylvania Railroad Company all the railroads, ferries, and other property leased by it in New Jersey, and to hold and operate the same. It is intended to hold the same relation to the Pennsylvania Railroad Company and to operate the New Jersey lines in the same manner as the "Pennsylvania Company" now operates the leased lines west of Pittsburgh. The corporators held a meeting in Trenton, January 30, and the stock was all subscribed for. A meeting will shortly be held for the election of officers. The capital stock is $5,000,000, with privilege of increase to $17,000,000, and the corporators are Benjamin Fish, R. F. Stockton, Charles Sitgreaves, Richard F. Stevens, Benjamin Williamson, Gershom Mott, Benjamin Clark, George A. Halsey and Thomas Jones York.

The Vienna Exhibition.

It is announced by telegraph that the Exhibition building has been completed. The following circular has just been issued to American exhibitors by General Van Buren, the Commissioner:

"You are respectfully notified that a United States Government vessel is now ready at the Brooklyn Navy Yard to receive the articles for the Vienna Exhibition and will sail on the 1st of March. You will, therefore, please forward immediately the articles for which you have been allotted space. Beside the address herein inclosed for the Vienna Exposition, which is to be placed on the outside and inside of your package, you will please mark the same: 'Vienna Exposition, U. S. Navy Yard, Brooklyn, N. Y. From ——, Group ——, Weight ——, Measurement (cubic feet) ——.'

"The goods must be delivered at the Brooklyn Navy Yard, not later than the 25th of February, free of all expense to this Commission, after which all freight and carriage to Vienna will be paid by the government. Insurance must be obtained by exhibitors. Particular care has to be taken to forward to this office notice of shipment, shipping receipts and detailed list of the contents of each box or package. Boxes should be put together with screws, so that they may be taken apart without injury, stored during the time of exhibition, and be ready for use again after the same is closed. Catalogues of articles which will be exhibited in the American Department of the Vienna Exhibition will be printed soon, and if from any cause you should be unable to forward your goods, you are requested to send immediate notification to this office. Exhibitors of machinery will have to provide countershafts, pulleys, belts, wrenches, oil-cans, etc., at their own expense. To save time and to avoid failure in operating the machines, the above-named articles should be sent together with the machines. There will be two main shafts; one of which has a diameter of three and a half inches (metre 0.09), and makes 120 revolutions per minute, and the other with a diameter of two and a half inches, making 250 revolutions per minute."

The Northern Pacific Railroad Company, we hear, is having a map prepared which will be 50 feet in length, and will show the character and extent of its land. The railroad company will also exhibit a collection of fruits, grains and other agricultural productions of the Northwest, for the purpose of tempting emigration thereto. There will be also on exhibition a collection of ores and minerals, illustrative of the country's mineral resources.

Mr. Stephenson, of New York, will exhibit a street car, and the Pullman Company several of their sleeping and drawing-room cars. Railroad managers and others who propose exhibiting anything should send in their applications *at once*.

The Master Mechanics' Association.

The following circulars have just been issued by the Secretary:

ON THE BEST FORM AND PROPORTIONS OF AXLES FOR CARS AND LOCOMOTIVES, ALSO WHETHER THERE IS ANYTHING GAINED BY THE USE OF COMPOUND AXLES AND LOOSE WHEELS.

The committee appointed at the last convention of the American Railway Master Mechanics' Association to investigate and report upon "*The best Form and Proportions of Axles for Cars and Locomotives, also whether there is Anything to be Gained by the Use of Compound Axles and Loose Wheels,*" desire information regarding the following points:

1. The dimensions of the standard car axles now used on your road, which please mark on the engraving.
2. When such standard axles break, at what point does the fracture usually occur?
3. State as near as you can, what proportion of breakages of axles *of the dimensions given* occur close to the hub of the wheel on the inside, and the relative proportion of breakages at other points?
4. If there were no car axles now in use, what size would you recommend for the diameter and length of journal for a *universal standard axle* for 4 feet 8½ inch gauge roads?
5. What for the diameter at the wheels at and at the center of the axle?
6. What are the dimensions of the driving and truck axles of your most approved locomotives?
7. State where the fracture of such axles occurs in cases breakage?
8. What is your rule for forcing on car and locomotive wheels; that is, how much larger is the axle than the hole in the wheel? and how much is the maximum pressure allowed in pressing them on?
9. Have you used any compound axles? or any axles upon which the wheels are loose or can turn independently one of the other?
10. Have you any means of knowing *experimentally* the difference there is between the resistance of a car or truck with loose and one with tight wheels in passing around curves of any given radius? if so, give the committee a report of such experiments.
11. What is your opinion of compound axles or loose wheels?

Replies to the above inquiries should be addressed to the Chairman of the Committee at No. 72 Broadway, New York, and are requested as early as possible, as much work for their report remains for the committee to do after the answers are received.

M. N. FORNEY, No. 72 Broadway, New York,
COLEMAN SELLERS, Philadelphia,
GORDON H. NOTT, Boston & Lowell & Nashua Railroad,
} *Committee.*

This committee would be glad to receive information referring to the subject under consideration from any source, and persons who are not members of the Association are invited to communicate with the Chairman.

MACHINERY FOR REMOVING SNOW FROM THE TRACK.

The Committee of the American Railway Master Mechanics' Association, appointed to report upon the subject of "The Machinery for Removing Snow from the Track," at their next annual meeting, to be held in Baltimore, on the first Tuesday in May, 1873, desire to call your attention to the following questions, and request an early reply:

1. Is your road over prairie or hilly country, and is it exposed to heavy winds?
2. How deep, generally, are your snows, and do they become very hard from effect of heavy winds?
3. Are you liable to wet, followed by cold weather, making ice, or are your winters, generally, cold and dry?
4. Do you use pony plows attached to your engines?
5. What arrangement have you for clearing flanges?
6. For heavy work how many engines do you use, and what is your method of managing a snow train?

Please describe your plows that you like best for the different conditions of snow, and if convenient please send photographs or tracings of plows and machinery for clearing flanges.

In answering the above questions, the Committee earnestly request that you give them your experience and ideas upon all points which may have been suggested to you in connection with this subject.

J. W. PHILBRICK, Maine Central Railroad,
J. M. FOSS, Vermont Central Railroad,
E. STUDLEY, Late of Concord,
} *Committee.*

Please address your replies to

J. W. PHILBRICK,
Master Mechanic Maine Central Railroad,
Waterville, Maine.

Railway Association of America.

The following circular to officers of railroad companies has been issued by Mr. Harry E. Sharpe, the Corresponding Secretary of the Association:

In order to preserve the materials for a future history of the development and economical results of the railroads of the United States, this Association has resolved to form a central depository, in which all such materials can be carefully sorted, compiled and kept. The Secretary has been instructed to place himself in communication with all railroads, and with such other persons as are likely to have reports, pamphlets, etc., which they may desire to see preserved. I have therefore to request the favor of your sending to my address copies of past reports, as many as you have on hand, and a copy of all future reports of your road, reports of experiments, and any other papers you may consider of general interest to the profession.

An Accident on the Elevated Railroad.

As a train on the New York Elevated Railroad was passing the corner of Nineteenth street and Ninth avenue, on the afternoon of January 31, the feed-pipe burst and the connecting-rod breaking tore a hole in the boiler, allowing all the steam to escape. The passengers were greatly alarmed at first, but somewhat recovered their equanimity on finding that no serious explosion had taken place; but a new problem now presented itself. At the point where the train was stopped there was no platform, and the passengers were some twenty feet above the street, with no means of descending. After some delay, a ladder was procured and the passengers reached the ground in safety, with the exception of one lady who preferred remaining on the car until dark. We understand that a light folding ladder has since been placed on every train, for use in case of accident.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—The stockholders of the Coal River (W. Va) Railroad met and elected the following board of directors: Florence Marmet, John A. Gano, L. H. Sargent, George Hafer and Davis Wilson, of Cincinnati; Thomas L. Brown, of West Virginia; Phillip S. Justice, Philadelphia; A. H. Roward, Allegheny City. The board of directors was organized by electing Florence Marmet, President; Thomas L. Brown, Vice-President; Davis Wilson, Secretary; and George Hafer, Treasurer. It was decided to have the chief office at Cincinnati, and a branch office at Charleston, W. Va.

—The following gentlemen have been elected trustees of the Atlantic & Pacific Telegraph Company: Oliver Ames, Cheney Ames, B. F. Allen, James Brooks, C. S. Bushnell, G. S. Bowdoin, George Bliss, Lyman Blair, W. H. Clay, John Duff, Sidney Dillon, T. S. J. Flint, H. M. Flagler, R. R. Graves, W. H. Guion, C. M. Morton, James Hendrick, C. G. Hammond, James Hegeman, H. G. Hamilton, J. N. Kinney, Levi P. Morton, John H. Mortimer, A. B. Meeker, S. H. Marks, S. D. McMillan, Alfred Nelson, Waldemer Otis, G. G. Sampson, N. C. Simons, W. D. Snow, E. D. L. Sweet, W. J. Syms, Henry M. Taber, John C. Voss, A. F. Wilmarth, H. D. Walbridge, Horace S. Walbridge, Russell Wheeler and Emory Wendell.

—Mr. A. Shaw, formerly Assistant Superintendent of the South & North Alabama Railroad, has been appointed General Forwarding Agent of the Atlantic Coast Line, at Portsmouth, Va.

—Mr. Benjamin Williams has been appointed Purchasing Agent of the Baltimore & Ohio Railroad in place of John Oliver, resigned.

—W. F. White has been appointed General Freight and Ticket Agent of the Atchison & Nebraska Railroad.

—Mr. D. M. Pickering has been appointed Assistant General Superintendent of the Central Railroad of Iowa, in place of C. F. Kirby. Mr. A Russell, General Freight and Ticket Agent, will assume the duties of Master of Transportation, in place of I. C. Manley, resigned.

—Mr. George L. Ingersoll, Treasurer of the Chicago & Illinois Southern Railroad Company, has assumed the duties of General Manager in addition to those of Treasurer. Mr. H. F. Nash, Auditor, will hereafter act as General Freight and Ticket Agent.

—James Justin has been appointed Auditor of the Cleveland & Pittsburgh Railroad, in place of G. F. Bingham, resigned.

—Mr. Allen Campbell has been elected President of the Cumberland & Pennsylvania Railroad Company, in place of J. A. Milholland.

—Mr. S. K. Johnson, formerly Superintendent of the Georgia Railroad, has been appointed General Superintendent of the same road, in place of E. W. Cole, resigned.

—Lucius Tuttle has been appointed General Freight and Ticket Agent and J. T. McManus Assistant Superintendent of the Hartford, Providence & Fishkill Railroad.

—Mr. C. Kelsey, late Assistant Auditor, has been appointed Auditor of the Indianapolis, Bloomington & Western Railway.

—Mr. Edward F. Osborn has been appointed Treasurer and Joseph A. Shinn Freight and Ticket Accountant by the receivers of the Indianapolis, Cincinnati & Lafayette Railroad Company.

—Mr. A. B. Southard, late Assistant Superintendent, has been appointed General Superintendent of the Indianapolis, Peru & Chicago Railroad. Mr. Macy, President of the company, has heretofore been also General Superintendent.

—Mr. George L. Schuyler has been chosen President of the Louisville, New Albany & Chicago Railroad Company, Mr. M. Sloat, Manager and General Superintendent, and W. H. Lewis, Secretary and Treasurer.

—S. H. Edgar, late Secretary and Treasurer of the Mississippi Central Railroad Company, has been appointed Vice-President of the same company. Mr. R. S. Charles, now Secretary and Treasurer of the New Orleans, Jackson & Great Northern, assumes the same office for the Mississippi Central also. Mr. E. D. Frost, General Superintendent, becomes General Manager, and R. Colquhoun, late Assistant Superintendent, becomes Superintendent.

—Mr. M. Burke is appointed Superintendent of the Mississippi & Tennessee Railroad in place of James Yonge. He was formerly Master Mechanic of the Memphis & Charleston Railroad.

—Mr. S. A. Hodgman, late Assistant Master Mechanic, has been appointed Master Mechanic of the Philadelphia, Wilmington & Baltimore Railroad, in place of G. W. Perry, resigned.

—Mr. H. C. Whitridge has been appointed Auditor of the Peoria & Rock Island Railroad.

—Mr. C. M. Stanton has been appointed General Freight Agent of the Springfield & Illinois Southeastern Railway, in place of McLene Doherty, who lately resigned to accept the position of Assistant Superintendent of the Logansport, Crawfordsville and Southwestern Railroad.

—Mr. W. J. Kirk has been appointed General Freight and Ticket Agent of the Port Royal Railroad, in place of J. H. H. Millett, deceased.

—Mr. George Maney has been appointed Superintendent of the Tennessee & Pacific Railroad, in place of J. H. Paramore, resigned.

—R. A. Packer has been appointed General Superintendent of the Sullivan & Erie Railroad.

—W. W. Borst, late Assistant Superintendent of the Denver & Rio Grande Railway, has been appointed General Superintendent.

—Mr. B. F. Matthias, late Superintendent of the Paris & Decatur Railroad, has been appointed General Freight and Ticket Agent of the Paris & Danville Railroad, in place of J. E. Duff, resigned.

—Mr. F. C. Stratton, formerly General Eastern Freight Agent of the Grand Trunk Railway, has been appointed Superintendent of the Paris & Decatur Railroad, in place of B. F. Matthias, who has resigned to accept a position on the Paris & Danville road.

—At the annual meeting of the Wilkesbarre & Philadelphia Railroad Company, held at Bloomsburg, Pa., recently, D. G. Waller was chosen President, John McNeish Secretary and Treasurer, and W. Neil, H. M. Hoyt, J. A. Funston and C. W. Neil, directors.

—At the annual meeting of the Clarion County Railroad Company, held at Sligo, Pa., January 13, J. P. Lyon was chosen President, W. M. Lyon, William Phillips, W. W. Barr, W. Reichart, D. E. Lyon, D. Maclay and B. M. Means, directors, and D. E. Lyon, Secretary and Treasurer.

—Mr. Mendes Cohen, who was at one time Manager of the Lehigh & Susquehanna Railroad, has been chosen President of the Pittsburgh, Washington & Baltimore Railroad Company, in place of William Keyser, who has resigned in order to devote his whole time to the duties of his position as Vice-President of the Baltimore & Ohio Railroad Company.

—At the annual meeting of the Macon & Augusta Railroad Company at Augusta, Ga., January 22, the following board of directors was chosen: John P. King, S. D. Heard, W. J. Magrath, G. H. Hazlehurst, James T. Gardiner, Thomas G. Barrett, J. K. Evans, Charles Estes, J. O. Mathewson, A. J. Lane, D. B. Sanford and L. N. Whittle. Subsequently W. J. Magrath was chosen President in place of G. H. Hazlehurst, and Dr. W. J. Mulligan was re-elected Secretary and Treasurer. Messrs. Magrath, Evans, Sanford and Whittle are new directors, replacing M. D. McGehee, the board having apparently three more members than last year. Mr. Magrath is President of the South Carolina Railroad Company. The road is leased and operated by the Georgia Railroad Company.

—At a meeting of the stockholders of the Memphis, Pine Bluff & Shreveport Railroad Company, held at Hopefield, Ark., January 30, S. W. Dorsey was elected President; F. M. Mahon, Vice-President; Frank S. Davis, Treasurer; C. C. Waters, Secretary. Among the directors are David Dows, of New York; Thomas A. Scott, of Pennsylvania; Judge Bocage, Hon. Alex. McDonald, Ira McL. Barton, of Arkansas.

—E. P. Lyman has been appointed Superintendent of Telegraph, P. R. Sutton, Master Mechanic, and E. Ryder, Road Master of the Chicago, Dubuque and Minnesota and the Chicago, Clinton & Dubuque railroads, of which Charles H. Hudson is General Superintendent.

—W. J. C. Kenney, for 18 years General Freight Agent of the Eastern Railroad, has resigned, to take a similar position on the Boston & Maine Railroad.

—On the 28th of January, the corporators of the Northampton & Shelburne Falls Railroad Company met at Conway, Mass., and organized. Joel Hayden, Lewis Bodman, Luther Bodman, Carlos Batchelder, Henry L. James, William Skinner, John Sprague, S. D. Bardwell, E. G. Lamson, C. N. Yeamans and F. L. Eldridge were chosen directors, Joel Hayden, of Haydenville, being subsequently elected President.

—Hugh J. Jewett was re-elected President, C. P. Casilly, Secretary, and Joseph C. Butler, Treasurer of the Little Miami Railroad Company, January 30.

—At the annual meeting of the Detroit, Eel River & Illinois Railroad Company, held January 21, the following board of directors was chosen: C. H. Buhl, James F. Joy, John Owen, Detroit; Elijah Smith, Boston; D. L. Quirk, Ypsilanti, Mich.; C. H. Davenport, Saline, Mich.; J. D. Corey, Manchester, Ind.; Wm. Waldron, Benj. Fisher and Ezra L. Koon, Hillsdale, Mich. Messrs. Owen, Smith, Davenport, Corey, Waldron, Fisher and Coon are new directors.

—The stockholders of the Joliet & Valparaiso Railroad Company met at Joliet, Ill., January 31, and elected the following board of directors: Wm. E. Henry, E. H. Aiken, H. N. Marsh, T. C. Lord, E. T. Chase, B. F. Russell, Charles Weeks, G. H. Munroe and A. J. Robinson. W. E. Henry was chosen President; B. F. Russell, Secretary; H. N. Marsh, Treasurer, and Samuel Reed, Chief Engineer.

—Colonel George A. Merrill has resumed the superintendency of the New London Northern road.

—At the annual meeting of the Burlington, Cedar Rapids & Minnesota Railroad Company, held at Cedar Rapids, Ia., January 22, the old board of directors was re-elected, as follows: Henry Clews, New York; Fitz Henry Warren, J. W. Barnes, T. W. Barhydt, Burlington, Ia.; George Greene, John F. Ely, S. L. Dows, D. W. C. Rowley, W. W. Walker, J. L. Bover, A. S. Belt, W. Green, Cedar Rapids, Ia.; J. W. Traer, Vinton, Ia. The board subsequently elected George Green, President; John F. Ely, Vice-President and Treasurer; H. B. Stibbs, Assistant Treasurer; D. W. C. Rowley, Secretary; W. Greene, General Superintendent; W. H. Pettibone, Assistant General Superintendent; W. W. Walker, Chief Engineer; J. C. Brocksmith, Auditor: A. S. Belt, Solicitor; S. L. Dows, Purchasing Agent, and J. W. Traer, General Agent. Mr. Brocksmith, the auditor, has been heretofore assistant auditor. The other officers are re-elected.

—Mr. Samuel King, late of the Chicago, Burlington & Quincy road, has been appointed Ticket Agent of the Rockford, Rock Island & St. Louis Railroad, with office at Rock Island, Ill., in place of F. C. Cheney, resigned.

—Mr. Andrew Peirce, who lately resigned the presidency of the Atlantic & Pacific Railroad Company, remains with the company as Vice-President and General Manager.

—The stockholders of the Little Miami Railroad Company have chosen the following directors: J. C. Butler, C. P. Cassilly, W. H. Clement, Edward Dexter, Henry Hanna, L. D. Harrison, H. J. Jewett, Richard Lewis, J. H. Rogers, H. E. Spencer, A. Hivling and J. R. Swan. The board elected officers as follows: H. J. Jewett, President; C. P. Cassilly, Secretary; Joseph C. Butler, Treasurer. These are all re-elections.

—Hon. J. A. Hubbell has been chosen a director of the Mineral Range & L'Anse Bay Railroad Company, in place of W. H. Streeter, resigned.

—Mr. Oscar G. Fox has been appointed Division Superintendent of the Detroit, Lansing & Lake Michigan Railroad in place of F. J. Conely, resigned. Mr. Fox has been a conductor on the road.

—At the annual meeting of the Chicago, Pekin and Southwestern Railroad Company, at Streator, Ill., January 14, F. E. Hinckley, J. L. Stark, A. B. Meeker, of Chicago, P. B. Shumway, of Evanston, David Strawn, H. W. H. Cashman, of Chicago, B. H. Harris, of Groveland, J. W. Dougherty, of Washington, W. P. Sisson, of Pekin, and A. E. Tyler, S. Plumb, J. Butler and F. Plumb, of Streator, were chosen directors. They organized by choosing F. E. Hinckley, President, A. B. Meeker, Vice-President, S. Plumb, Treasurer, and F. Plumb, Secretary. Messrs. Meeker, Shumway, Cashman, Harris, Sisson and Tyler are new directors.

—The first board of directors of the newly organized Varna, Peru, Mendota & State Line Railroad Company is as follows: C. C. Merrick, Chicago; J. C. Crocker, E. A. Brown, Mendota, Ill.; C. Kellum, R. L. Devine, Sycamore; M. L. Joslyn, J. H. Johnson, Woodstock, Ill.; T. D. Brewster, Peru, Ill.; Job Toles, Greenwood, Ill.; C. H. Tryon, Hebron, Ill.; W. H. Purdy, Richmond, Ill.; L. Ayers, Burlington, Ill.; J. Hagerman, Milwaukee.

TRAFFIC AND EARNINGS.

—The earnings of the Paris & Danville Railroad for the first half of January were $1,932.82, of which 1,307.97 was from freight and $517.35 from passengers. The operating expenses were $931,60, leaving the net earnings $1,001.22. The earnings of the company from mines were $4,972.25, and the expenses $3,444.00, leaving the net earnings from that source $1,528.25. The total net earnings of road and mines were $2,529,47.

—The earnings of the Kansas Pacific Railway for the third week in January were: from passengers, $14,168.15; freight, $23.237.70; mails, $2,055.31; total, $39,461.16. Of this amount, $6,777.64 was for transportation of troops, mails and government freight.

—The earnings of the Great Western Railway of Canada, for the week ending January 10, were: 1873, £18,012; 1872, £20,527; decrease, £2,515, or 12¼ per cent.

—The earnings of the Grand Trunk Railway, for the week ending January 11, were: 1873, £27,600; 1872, £33,600; decrease, £6,000, or 17⅞ per cent.

—From a statement made by the New York Central & Hudson River Company to the Constitutional Commission now sitting at Albany, N. Y., it appears that in 1872 there were 203,351 cars passed over the Central, of which 103,444 freight and 21,288 stock cars were transferred to the Boston & Albany at Albany, and 63,140 freight and 16,679 stock cars to the Hudson River road. An officer of the road further states that 69 per cent. of the through traffic goes to New England, and only 31 per cent. to New York.

OLD AND NEW ROADS.

[Continued from page 55.]

North Pacific, of California.

An injunction has been issued by the Fifteenth District Court of California, restraining the company from issuing any bonds without the unanimous vote of the board of directors.

Northern Pacific.

The long pending controversy between the Northern Pacific Company, the State of Wisconsin and the city of Duluth has been settled by a compromise. The Northern Pacific Company agrees to extend its road to the city of Superior within eight months, and to give that city the same facilities for business as Duluth. The dyke is to be removed, and the bay of Superior is to be dredged out from the entrance to the docks at Superior and Duluth. The dyke has been the main point of controversy, the Wisconsin people claiming that it would eventually destroy the harbor of Superior City.

Colorado Central.

Tracklaying on the Georgetown Branch was commenced January 26, at the forks of Clear Creek.

Iowa Central.

It is reported that negotiations are in progress for the lease of this road to the St. Louis, Kansas City & Northern Company.

San Francisco & North Pacific.

It is reported that this road has been sold by its present owners, who are all stockholders of the Central Pacific, to Mr. Donahue, the builder and original owner of the road. It extends from Donahue, on the north side of San Francisco Bay, north to Cloverdale, 56 miles.

Texas & Pacific.

The surveying parties have completed the survey of the line from San Diego, Cal., by way of San Luis Key and Temecula to the Gorgonio Pass, and report that the line found is a much better one than was expected.

Rockford, Rock Island & St. Louis.

The Frankfort committee of bondholders has been informed that the money for the payment of the February coupon of the converted bonds of this company has been forwarded to Europe. A majority of the bonds have been converted.

The receipts of the road for August, September and October are reported to have been $277,118.68, the expenses $195,725.13, and the net earnings $81,393.55.

International & Great Northern.

The Galveston (Tex.) *News* is informed that the track of the International road was completed to Longview, January 22. Longview is on the Texas & Pacific, and is 12 miles beyond Kilgore, the late terminus. This completes an all rail line from Galveston to Shreveport, La., 341 miles long, the distances being: From Galveston to Houston, by Galveston, Houston & Henderson, 50 miles; Houston to Palestine, by Great Northern, 150 miles; Palestine to Longview, by International, 76 miles; and Longview to Shreveport, by Texas & Pacific, 65 miles. The gauge of the line from Galveston to Houston is 5 feet 6 inches, while that of the International & Great Northern is 4 feet 8½ inches. The Texas & Pacific from Longview to Shreveport is now of 5 feet 6 inches, but will shortly be changed to the standard gauge.

Missisquoi & Clyde Rivers.

This line when completed will extend from Richford, Vt., east through Newport to Island Pond, 52 miles. At Richford connection is made with the Southeastern Counties Junction Railway of Canada, and also with the Missisquoi Valley road to St. Albans; and at Newport with the Connecticut & Passumpsic Rivers Railroad. In connection with these lines, the road will form part of a new line from Boston to Montreal. The grading is nearly all completed and 22 miles of track have been laid. It is expected that the road will be completed and opened for business from Richford to Newport, 32 miles, during the present year. No work has yet been done on the extension from Newport east to Island Pond on the Grand Trunk road.

New York & Oswego Midland.

The track on the southern end of the road has been extended from Liberty Falls, N. Y., northwest to Morston, in Sullivan County, about 12 miles. On this section there is a bridge over a branch of the Mongaup near Liberty Falls nearly 1,000 feet long and 100 feet above the water and a trestle work near Falisburgh tunnel over 60 feet high.

Cleveland, Mt. Vernon & Delaware.

The track is laid to Sunbury in Delaware County, O., which is within 22 miles of Columbus and 14 miles beyond the last point noted.

Danville, Tuscola & Western.

The Tuscola (Ill.) *Journal*, of recent date, says: "We learn that active operations are to be commenced on the Danville, Tuscola & Western Railroad early in the spring. The entire grade is complete between this point and Dallas, and considerable work is done beyond Dallas."

Galena & Southwestern.

It is intended to commence laying track on this narrow-gauge road early in the spring, and the grading is so far advanced that it is thought there will be no delay in laying the track from Galena, Ill., to Platteville, Wis., 36 miles.

Muscatine Western.

The injunction against the payment of the 5 per cent. tax voted by Muscatine County, Iowa, to this road has been dissolved, and the tax, amounting to $135,000, will have to be paid.

Illinois, Missouri & Texas.

The work on this road, formerly known as the Cape Girardeau & State Line, is said to be progressing well. It is said that the company has secured means sufficient to iron the first 40 miles of the road.

Classification of Railroads in Missouri.

A bill has been introduced in the Missouri Legislature to establish maximum rates for passenger fares on the railroads of that State. The roads are to be divided into four classes: Class A to include those whose gross income is over $3,000 per mile per year, and for roads of this class the maximum charge will not exceed three cents per mile; Class B, income between $6,000 and $3,000, maximum charge three and one-half cents per mile; Class C, income between $4,000 and $6,000, maximum charge four cents per mile; Class D, income under $4,000, maximum charge, five cents per mile.

Indiana & Illinois Central.

The Tuscola (Ill.) *Journal* of recent date says: "At last accounts about ten miles of track had been laid this way from the junction this side of Montezuma, Indiana. The timbers and fixtures of the bridge over the Wabash, or a portion of them,

are somewhere between Montezuma and Toledo, Ohio, on the canal ice-bound, but they are to be transported from thence by rail. The bridge for the Sangamon, this side of Decatur, Ill., is now being put up. It will be in position long before the track-layers reach it. We learn that some two hundred freight cars have been ordered for the road—indeed they are nearly all ready for delivery. Also a number of passenger coaches."

Chicago & Northwestern.

The company on the 4th inst. applied to the New York Stock Exchange to have its new consolidated 7 per cent. gold bonds, to the amount of $48,000,000, placed on call. Of this amount $35,349,000 will be held to redeem the bonds already issued as they mature.

The Sparta (Wis.) *Herald* states that surveys have been completed for the temporary track around Tunnel No. 3, on the Madison Extension. Only about four miles of track will be required. The western end of the extension from Winona Junction to Tunnel No. 3 is now completed and ready for business, and it is expected that by the time the temporary track is completed the two other tunnels will be opened through and trains can run over the whole length of the extension. Tunnel No. 3 is about nine miles east of Sparta, Wis.

St. Louis & Southeastern.

This company is now having the surveys of the Shawneetown & Madisonville Division completed, and purposes, it is said, to construct that division during the coming season. The line extends from Madisonville, Ky., 39 miles south of Henderson, northwest 45 miles to a point opposite Shawneetown, Ill., and when completed cars can be carried across the Ohio River by a short ferry at Shawneetown, and the long transfer from Evansville to Henderson avoided.

Washington & Ohio.

It is said that the President of this company recently tendered to the Auditor of the State of Virginia a quantity of unpaid coupons of Virginia State bonds in part payment of instalments due by the company on the purchase of the State's interest in the Alexandria, Loudoun & Hampshire road. The Auditor declined to receive the coupons.

Sodus Point & Southern.

It is stated that for the privilege of crossing the New York Central at Phelps, N. Y., this company paid $15,000 and agreed to pay $800 per year to maintain a flagman at the crossing.

Chicago & Western Springs.

This company has filed articles of incorporation with the Secretary of State of Illinois. The capital stock will be $400,000. and the office is in Chicago.

Wilmington, Piper City & Vincennes.

A company has been incorporated with a capital of $2,000,000, to build this road from Wilmington, Ill., on the Chicago & Alton 53 miles from Chicago, south through Paxton to Vincennes, Ind., a distance of about 190 miles.

New Mail Route.

An extension of mail carriage on the Jackson, Lansing & Saginaw road from Wenona, Mich., north to Roscommon, 78 miles, has been ordered.

Houston & Texas Central.

The track has reached a point about 10 miles from Sherman, Texas, and eight miles beyond Van Alstyne, the later terminus.

Rochester, Nunda & Pennsylvania.

Tracklaying on this road was commenced January 24.

Dakota Southern.

Trains are now run regularly from Sioux City, Iowa, to Yankton, Dak., the road being completed.

Mercer & Somerset.

This road has been opened to Hopewell, N. J., five miles beyond Pennington, the late terminus. Regular trains will begin running to that point soon.

Central of New Jersey.

In the case of the Delaware, Lackawanna & Western Company against this company, the Vice-Chancellor of New Jersey has enjoined the Central from taking up the third rail on its road, or in any way interfering with the use of its broad-gauge track in connection with the Delaware, Lackawanna & Western Railroad, and has ordered the Central to continue to transport the coal of the Delaware, Lackawanna & Western in broad-gauge cars as heretofore.

Easton & Amboy.

This company, which is building the Lehigh Valley's New Jersey line, asks for authority to build branch lines from its main road to Flemington, in Hunterdon County, also to East Millstone, and for general authority to build short branches to connect with any other road, now built or to be built hereafter.

Great Western, of Canada.

This company invites sealed proposals for the construction of a car-ferry steamer for use on the Detroit and St. Clair rivers, to be 280 feet measurement over all. Plans can be seen and specifications obtained by applying to W. K. Muir, General Superintendent, at Hamilton, Ontario. Proposals will be received up to March 1, 1873.

The company have also been advertising for proposals for 50,000 white oak ties to be not less than 8 feet long, 9 inches face and 6 inches thick. Ten per cent. of the ties must be 12 inches on the face, for joints.

Chicago & Atlantic.

A telegram from Fort Wayne, Indiana, says that negotiations are pending between a company of this name and some English capitalists for the construction of a railroad from Chicago through Rochester, Huntington and Bluffton, Ind., to Marion, O., on the Atlantic & Great Western road.

Quincy, Alton & St. Louis.

The Supreme Court of Illinois has just decided a case involving $200,000 in bonds voted by Adams County, Ill., to this road in 1869. The Supervisors refused to deliver the bonds afterwards, on the ground that the route of the road was changed after the vote was taken. The company brought suit to obtain the bonds, and the case has now been finally decided in favor of the county and against the company.

Illinois Grand Trunk.

In August, 1869, the town of Ohio, Bureau County, Ill., voted $40,000 to this company, on certain conditions, which were not acceptable to the company; and a second election was held in June, 1870, to decide whether the bonds should be voted without conditions, and the proposition was voted down. It has since been found that the bonds were issued secretly by the Supervisor and Clerk of the town, and a demand was made for the interest. An injunction has just been issued restraining the payment of the interest or principal of these bonds.

New Jersey Railway.

A bill has been introduced in the New Jersey Legislature chartering a company by the above name with authority to build a railroad from New York to Philadelphia, by way of Bound Brook. The capital is $5,000,000, and the corporators named are George A. Halsey, Benjamin G. Clark, Congressman Isaac W. Scudder, Daniel Dodd, John G. Stevens, William G. Cook, Hugh M. Gaston, Charles Sitgreaves, Robert F. Stockton, John S. Irick, Augustus Van Zandt, Nehemiah Perry and Thomas McKeen. This is the fourth bill now pending for a new through road. Among the corporators of this last scheme are several names of gentlemen formerly connected with the Joint Companies as directors or stockholders, but it is not known yet whether they favor the bill or whether their names have merely been used by its promoters.

Denver, Georgetown & Utah.

The preparations for the construction of this road have been suspended for a time, owing to propositions made by the Colorado Central Company for a compromise. These negotiations have fallen through, and the work on the Denver, Georgetown & Utah road is to be commenced soon and pushed forward as rapidly as possible.

Hudson & Lake Champlain Ship Canal.

A bill has been introduced into the New York Assembly which provides for the improvement of the Hudson River from Troy to Fort Edward, and making a ship canal from there to Whitehall, a distance of thirty miles, so that vessels of 800 to 1,000 tons can pass from Lake Champlain to the Hudson River. Should this bill pass, and the construction of the work be at once begun, it is claimed that by the time it is completed the Canadian canals will be enlarged and the Caughnawaga Canal built, so that steam vessels of 1,000 tons burden can pass from Duluth, Milwaukee, Chicago, and the lakes to the cities of Troy, Albany and New York without breaking bulk, and in six days less time than it now takes. The estimated cost is from six to nine millions.

The value of an improvement which will enable lake vessels engaged in the grain trade to pass through to New York will be enormous, if it be such that there will be no heavy tax for tolls and tonnage, and no considerable delay in passing through the several canals, which by the route proposed would all be short.

Hackensack & New York.

A bill has passed the New Jersey Legislature authorizing this company to consolidate with the Hackensack Extension Company, provided three-fifths of the stockholders consent thereto. The name of the new company will be the New York & New Jersey Railroad Company.

Hunterdon.

This new company proposes to build a railroad from New Hampton, N. J., the junction of the New Jersey Central and Delaware, Lackawanna & Western roads, southeast through Clinton and Flemington to Hillsborough township, in Somerset County, a distance of about 25 miles. The capital stock is to be $500,000, and the corporators are George F. Crater, John T. Leigh, William M. Shipman, F. A. Poist, James H. Sullivan, Johnson D. Banghart, John Gardner, John Evelend, Joseph W. Wood, David H. Banghart. An extension of about five miles would connect this line with the Millstone Branch of the New Jersey road.

Delaware Shore.

This company proposes to build a railroad from the West Jersey road near Woodbury, N. J., southwest to Penn's Grove, on the Delaware, a distance of 17 miles. The capital stock is to be $200,000.

North & South Jersey.

This company is asking for a charter to build a railroad from Salem, N. J., northeast through Mount Holly and Princeton to some point near Somerville, a distance of about 90 miles. This road would cross all the lines from Philadelphia to New York, and the southern half would be a good line for travel from South Jersey to New York. The capital stock is to be $2,000,000, with the privilege of increasing it to the actual cost of the road.

Dover, Lewes & Rehoboth.

It is proposed to build a railroad from Dover, Del., southeast through Milford to Lewes, opposite the Delaware Breakwater, a distance of about 37 miles. It is said that the road would pass through a fertile country, but the Junction & Breakwater road, which extends from Lewes to the Delaware Railroad on a line south of that proposed, and with which the new line would have to compete for much of its business, has been lately reported as not earning enough to pay its running expenses.

New Florence & Ligonier Valley.

This company proposes to build a railroad from New Florence, Pa., on the Pennsylvania road, 64 miles east of Pittsburgh, southwest to Connellsville, a distance of 45 miles. The road will open a new coal region.

Fredericksburg, Orange & Charlottesville.

Work on this road is progressing well. About half the grading on the unfinished portion of the line, 22 miles, is completed. The depot and shops at Fredericksburg, Va., are nearly finished. It is hoped that the road will be ready for use by May 1.

Orange, Alexandria & Manassas.

It is reported that surveys are to be made at once for a bridge over the Potomac at Georgetown, D. C., and a railroad connecting this road with the Baltimore & Ohio by way of Georgetown.

Alexandria & Washington.

The work of laying a double track on this road is rapidly progressing. Some double-ender locomotives have been ordered, and trains will soon be put on to make frequent regular trips between the two cities.

Macon, Monticello & Atlanta.

This company expects to connect Macon and Atlanta by a line 102 miles long. The company hopes to make arrangements to use the track of the Georgia road, from Atlanta to Covington, 40 miles, and the Macon & Augusta for 12 miles from Macon, leaving only about 50 miles of track to be constructed. Campbell Wallace is President of the company, and J. T. Grant, J. H. James, W. A. Huff, C. A. Nutting, G. H. Hazlehurst, E. Steadman, W. A. Davis, G. T. Bartlett, F. Gooldsby and T. Clower, directors.

Jacksonville, Pensacola & Mobile.

This road has been taken possession of by the United States Marshall, under orders of the United States District Court for Florida. Mr. F. B. Papy (who was the company's General Ticket Agent), who has been in control of the western section of the road as Receiver under the State courts, has been appointed a deputy marshal, and placed in charge of the whole road as Superintendent.

Marshall & Coldwater.

This road is now graded and ready for the track from Coldwater, Mich., north to Olivet, 40 miles. Work is going on on the line from Olivet to Elm Hall in Gratiot County, 70 miles, and it is hoped the grading will be completed during the coming season.

New Michigan Companies.

The following companies, of which no notice has heretofore been made, were organized in Michigan during the past year:

The Lansing & St. John's Railroad Company purposes to build a railroad from Lansing north to St. John's, 20 miles. Capital stock, $1,000,000.

The Lapeer & Holly Railroad Company purposes to build a road from Lapeer southwest to Holly, 25 miles. The capital stock is $200,000.

The Lapeer & Port Austin Company intends to build a railroad from Lapeer northeasterly through Tuscola, Sanilac and Huron counties to Port Austin, 70 miles. Capital stock, $600,000.

The Ohio, Quincy & Grand Haven Company intends to construct a line from Grand Haven southeast through Allegan, Barry, Kalamazoo and Calhoun counties, to Quincy in Branch County, 110 miles. Capital stock, $2,000,000.

Lawrence & Southwestern.

Regular trains are now running on this road from Lawrence, Kan., to Carbondale. The stations and distances from Lawrence are: Siegel, 7 miles; Clinton, 10; Steele's, 14; Learnerd's, 20; Garrett's, 23; Ridgeway, 26; Summit, 30; Carbondale, 32. At Carbondale connection is made with the Atchison, Topeka & Santa Fe Railroad.

Paducah & Memphis.

Track has been laid 11 miles beyond Troy, Tenn., which is three miles further than at last accounts.

Green Bay & Lake Pepin.

Regular trains are now running to Merrillon, the crossing of the West Wisconsin road, 150 miles from Green Bay. From Merrillon west to the Mississippi the road has not been finally located, but work will be commenced in the spring.

Northampton & Shelburne Falls.

The corporators of this railroad company met at Conway, Mass., January 28, and voted to accept the act of the Legislature extending the time of building the road from Williamsburg to Shelburne Falls. A committee was appointed, consisting of Joel Hayden, Lewis Bodman and John Sprague, to open the books for subscription to the stock of the company, or to negotiate with the Massachusetts Central for the purpose of extending its road to the Hoosac Tunnel through Williamsburg.

Lewiston & Auburn.

Ground was broken about the 20th ult. for this new Maine railroad, and the contractors expect to have it graded by next July.

Milwaukee & St. Paul.

A telegram from Madison says that the route of the line which this company offers to construct for the St. Croix & Superior land grant is as follows: From some point on the St. Croix River to Hudson, and thence to Lake Superior and Bayfield, sixty miles this year, forty miles yearly; and, also from some point on the Mississippi below Lake Pepin, up the Chippewa Valley to Chippewa Falls and Menominee, and a section from the Mississippi to Durand, or from Eau Clair to Chippewa Falls, within a year.

Navigation of Red River of the North.

An attempt will be made to obtain appropriations by Congress to improve the navigation of the Red River so that steamboats may run up as far as Breckinridge, the western terminus of the St. Paul & Pacific Railroad, at ordinary stages of water, it being accessible now only during high water in the spring, and Frog Point, 75 miles below (north) being the lowest point to which boats can ascend at low water. The St. Paul *Press* says:

"During the past year there have been built at Breckinridge one steamboat, the Dakota, one barge, and one hundred flat-boats, and there will be built, for next season, at least one steamboat, same size of the Dakota, one or two barges and double the present number of flat-boats. As an evidence of the amount of business done at Breckinridge and Moorhead in 1872, it may be stated that upwards of three million pounds of freight have passed through the former place, and five millions through the latter. Twenty-five miles of wagoning are necessary in order to reach Fort Garry from Moorhead. During the next season it is estimated from one to three million feet of lumber will be floated down the river.

"The Saskatchewan River is navigable from its mouth an unknown distance, and a steamer is to be built, immediately, for business on this stream."

Memphis, Carthage & Northwestern.

It is reported that $200,000 of bonds purporting to have been issued to this company by the "cities" of Gregory, Cloud and Budlong, all in Cherokee County, Kansas, said cities not being large enough to have post offices as yet, and having no legal existence as municipalities, were registered with the State Auditor of Kansas, and were accepted by reputable New York bankers for negotiation.

Cayuga Lake.

This road was reported completed from Ithaca to Cayuga, N. Y., in December last, but again a "last rail" is reported to have been laid on it on the 30th of January.

THE SCRAP HEAP.

Lighter Locomotives in England.

An English exchange notices the introduction on the London, Brighton & South Coast Railway of locomotives weighing 25 tons, loaded, in the place of engines weighing 38 to 40 tons, for traffic in the city of London. They have six wheels connected, 3ft. 11½in. in diameter, and are said to have the qualification of quick starting and stopping, which is essential for the city traffic.

Durability of Cast Iron.

At a meeting of the Polytechnic Association of the American Institute, Mr. W. J. McAlpine said: "It is supposed that cast iron oxidizes rapidly in salt water. I have seen in Europe square piles that had been 47 years in salt water, with the weights marked on them, taken up and broken up, and no appreciable loss had taken place. Even the corners seemed sharp and distinct. Here we see water pipes decomposed; and what is the explanation? One kind of iron will decompose and another will not. Where the carbon and the metallic iron are in intimate chemical combination, it will last 100 or 1,000 years, perhaps. The white or gray iron is incorruptible, while the soft foundry iron decomposes readily. I have taken up water pipes that I myself laid 30 years ago, and found them not corroded a particle. I have taken up others, which, as you took up a pipe, broke to pieces.

Milwaukee Iron Works.

The Milwaukee Iron Company, of Milwaukee, Wis., reports that it will turn out this year fully 35,000 tons of railroad iron and 32,000 tons pig iron. It employs about 1,000 men, and pays out every month from $70,000 to $75,000 for labor. The works will use this year 60,000 tons of soft coal, 20,000 tons of hard coal, 20,000 tons of coke, 25,000 tons of limestone, and 70,000 tons of iron ore, about three-quarters of which is from Iron Ridge, 45 miles from Milwaukee.

A Hard Case.

The Winona *Republican* reports that a telegram was received from the conductor of a train on the Winona & St. Peter road during the recent storm, stating that his train was snowed up near Lewiston, Minn., with no immediate prospects of getting out and that a passenger on board had just commenced to break out with small-pox. It was impossible to remove the sick man and he had to be left on the train.